Railway Age Gazette

FIRST HALF OF 1916—NO. 3 SIXTY-FIRST YEAR

NEW YORK: Woolworth Bldg.
CHICAGO: Transportation Bldg.

NEW YORK—JANUARY 21, 1916—CHICAGO

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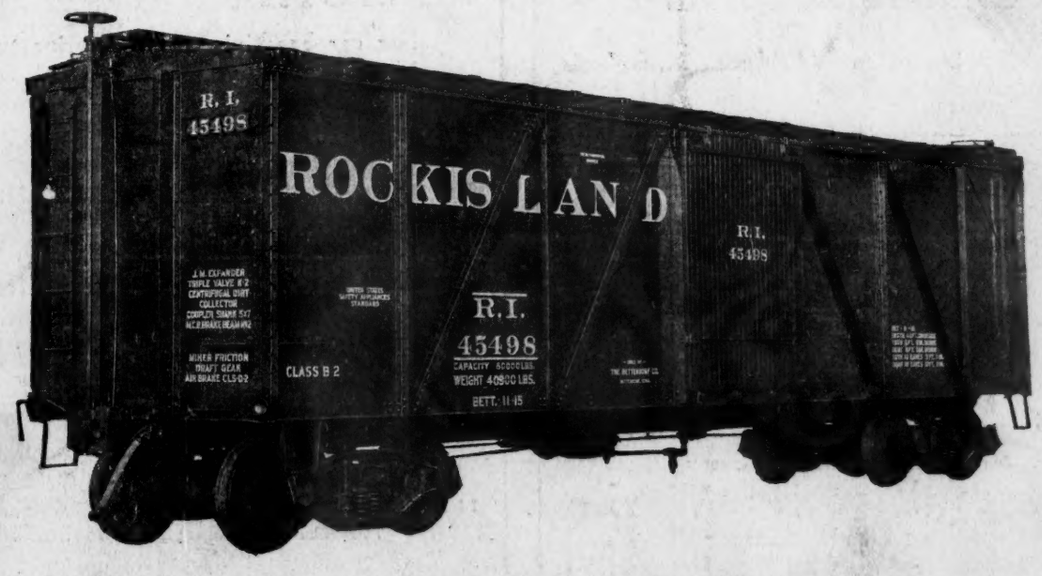

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Railway Age Gazette

Volume 60 January 21, 1916 No. 3

Change of the Fiscal Year

It will be recalled that the result of the canvass made by a special committee of the Association of American Railway Accounting Officers in regard to changing the fiscal year from June 30 to December 31 resulted in a vote of 78.2 per cent of the total mileage in favor of the change and 16.7 per cent opposed to the change. This was a canvass, of course, of the members of the accounting association. The association has now completed a canvass of the chief executive officers, and, of the total 276,177 miles represented by this canvass, 235,902, or 85.5 per cent, were in favor of the change and but 40,275 miles, or 14.5 per cent, were opposed to the change. The committee in charge of this matter, of which Frank May, comptroller of the Chicago, Rock Island & Pacific, is chairman, has been doing remarkably good work in pushing a reform which, when accomplished, will yield what are acknowledged to be very desirable results. The greatest difficulty in putting through a reform of this kind is to overcome the inertia of so large a body as is represented by the accounting officers and executive officers of 276,177 miles of railroad and the various state commissions and the Interstate Commerce Commission. The committee has had the loyal co-operation of the association, and while the work of getting the state commissions and the Interstate Commerce Commission to sanction the change of the fiscal year to December 31 cannot be undertaken until the association has finally approved of this change, both state commissioners and interstate commerce commissioners who have discussed the subject have shown a willingness to co-operate that is very encouraging. The vote of the executive officers is a long step in the progress which is being made. The fact that even a greater proportion of executive officers than accounting officers are willing to have the comparisons with previous years made slightly more difficult by a change in the fiscal period shows that the advantages which are to be gained are pretty fully understood by those who have the power to finally approve or disapprove of the step.

Examinations on the Train Rules

It is often difficult to keep up enthusiasm in a matter that requires a lot of hard work with but little evidence of satisfactory results; and the pointed questions concerning examinations on the train-rule book which are propounded by Mr. Coss, in another column, will appeal to many officers as parallel to what is—or which they know ought to be—in their own minds. The enthusiast has two drawbacks: (1) a fair average efficiency seems to be maintained without this exercise of extreme care in the educational processes, and (2) some of the worst errors are made by men who have passed a satisfactory examination on the rules. Neither of these is a good excuse. A "fair average" can never be really satisfactory. Single errors can produce such great disasters that no goal but perfection is permissible. The British railways maintained for years a high average of safety, but last year had the worst train wreck in history; and by the simplest imaginable error. To know the rules is not the same as knowing how to perform one's duty in the best manner; but drilling on the rules is the best possible introductory exercise; the best means preparatory to finding out how men do perform their duties and what they need for the future. Is there any better way? Mr. Coss' suggestion to import a teacher from some other road is a good one. St. Paul advised Christians to propagate their truths in season, and out of season; by any or all means. Does not that rule apply equally well to the American railroad man's "bible"? Trainmen's efficiency is based on (*a*) knowledge of the rules plus (*b*) knowledge gained by experience. The superintendent must teach them how to use the lessons of experience. How better can he do this than with the book of rules for his program? To have *a* all in books and *b* all outside of books is a weak plan which has been far too extensively used. The real function of the precepts in the rule book is that of serving as starting points from which the superintendent, or his deputy, can formulate and enforce the hundreds of other precepts which are essential to good practice.

Who Increased Railway Efficiency?

The *Railway Age Gazette*, in its issue for December 3, 1915, published an editorial showing how the railways of the United States have been securing efficiency and economy by increasing their freight train loads. A newspaper correspondent in Boston has sent out a letter containing an interview with "Professor Charles Zueblin in which credit for the economies made is given to Louis D. Brandeis. The methods the railways have used are called "Mr. Brandeis's methods," and Mr. Zueblin says, "Brandeis is making them (the railroads) eat crow, and how they hate it!" There is as much sense in attributing the increased efficiency to Brandeis as there would be in attributing it to Zueblin. The figures which we gave regarding increases in train loads covered the 20-year period from 1894 to 1904, and Mr. Brandeis never advanced his theories regarding "scientific management" until he appeared as an attorney in the eastern rate advance case in 1910. Seventy-three per cent of the total increase in the average train load between 1894 and 1914 was accomplished between 1894 and 1910; in other words, 73 per cent of this particular kind of increase in efficiency had been achieved before the railway managers of the United States ever heard that there was such a person as Louis D. Brandeis. Furthermore, the method by which Mr. Brandeis suggested that the railways could save such enormous sums of money was the application of certain principles of "scientific management" to the operation of their shops; and the railways have made practically no progress in the application of these particular principles. The great economies, as we pointed out, have been made by the increase of train loads; and the "tonnage" system, originated, not with theorists, but with railway managers, principally, James J. Hill, and has been carried out by them entirely without the assistance or coöperation of the reformers or the regulating authorities. "Professor" Zueblin wisely suggests many other ways in which he imagines the railways could save millions and even billions of dollars. There is no cock-sureness like that of the ignorant. Fortunately the railways are not man-

aged by men who have no capacity for doing anything except that for saying things.

Trusting the Conductor and Engineman

The mere fact that a man is considered worthy to command a train or drive a locomotive should guarantee his judgment and make it unnecessary for the train despatcher to spend a good share of his time in preparing and sending telegraphic orders conveying to conductors and enginemen information or commands which they already have. This sounds axiomatic and reasonable, and invites acceptance. It is an extract from a letter signed "Homer Pigeon," printed in the *Railway Age Gazette* December 31, page 1225, protesting against the habit—perhaps the thoughtless habit—of some superintendents in requiring despatchers to send regular train orders warning trainmen of changes in weather. Homer Pigeon's letter is perhaps rather highly colored in some of its allegations, but it will be admitted that it touches a live question. Too much assistance weakens a man's powers of self-reliance. This fundamental principle is violated by despatchers everywhere. Not only this; the weakening process is sometimes prescribed and encouraged. The despatcher who adds to an order to a freight train a reminder that a certain regular passenger train is on time is praised as the best kind of despatcher. He may prevent the freight men from forgetting the passenger train and carelessly encroaching on its rights. The reason for this excessive use of "orders" is found, of course, in the general feeling—often well founded—that the "mere fact that a man is an engineman" does *not* guarantee his judgment. The present-day lesson is simple and is well known; cultivate his judgment. And it is old as well as simple. The only fresh variation that we can think of is that the superintendent himself should do more of this cultivation, leaving less to be done by the engineman on his own account. It is true, of course, that a big difficulty arises when the cultivating process fails, and it is necessary to "demote" the engineman; but the first step is plain, anyhow. Perhaps a good bit of "cultivation" for the superintendent would be to forbid him to have his despatchers issue "weather orders" and such-like. Deprived of this resource he would bestir himself to find something to take the place of it.

A YEAR WITHOUT A NET CAR SHORTAGE

THE monthly statistical statement of the American Railway Association reporting freight car surpluses and shortages as of January 1, and the previous statement for December 1, indicate that the fears expressed for a time as to the possibility of a serious car shortage were to a considerable extent unwarranted. The rapid accumulation of freight at the ports, causing a congestion which tied up many thousands of cars, and the unusually heavy movement of grain from the west at a time when the eastern roads were handling an unprecedented amount of export traffic, made such large demands on the facilities of the railways that on November 1 the American Railway Association report showed a shortage of 26,000 cars, although there was at the same time a surplus of 52,000. Instead of getting worse during November, however, as was generally expected, the situation was somewhat improved on December 1, when the shortage had been reduced to 23,391, and the surplus had increased to 60,793. On January 1, there was a shortage of only 21,745 and a surplus of 68,700, so that with the exception of the conditions at the ports, for which the railroads can hardly be considered responsible, they have handled a record-breaking traffic in an unusually satisfactory way.

The fact that there was a net surplus of freight cars throughout the entire year 1915, whereas in former years a smaller volume of business has sometimes caused net shortages, shows that the railroads have improved to some extent, at least, in efficiency. It is interesting to compare the situation which has existed during the past three months with that of previous years, as shown by the car reports for the periods of heaviest traffic. On November 1, 1914, the American Railway Association reported a surplus of 172,325 cars, with a shortage of 2,229. No figures were compiled for December 1, 1914, but it is known that there was a very large surplus at that time. In 1913 the peak of the traffic was shown in the report for October 15, when there was a shortage of 43,246 and a surplus of 41,994. In 1912 there was also a net shortage, when the total shortage on November 21 was 73,475 and the surplus was 22,363, while in 1911 and 1910 there were net surpluses throughout the year. In 1909 in November there was a shortage of 39,902 and a surplus of 36,616, although the largest net shortage that year was on October 27, when the surplus was 30,896 and the shortage 36,636. In 1908 there was a large net surplus throughout the year, and in 1907, on October 30, there was a shortage of 90,757 and a surplus of 3,946. In five years (1908, 1910, 1911, 1914 and 1915), out of the last nine since the American Railway Association began compiling statistics of car surpluses and shortages, there was always a net surplus of freight cars, while in four years, 1907, 1909, 1912 and 1913, there were net shortages at the times of heaviest traffic.

THE REDUCTION IN RAILWAY ACCIDENTS IN 1915

THE greatest improvement in safety of railway operation ever recorded for a year is shown by the annual accident bulletin just issued by the Interstate Commerce Commission for the fiscal year 1915. As a result of the combined effect of the safety first movement, of improvements in facilities of various kinds and of the slump in railway traffic caused by the business depression, the accident record of the railways of the United States for 1915 is in most respects the best ever reported, even when allowance is made for the reduced chances for accident resulting from the decrease in traffic. It is necessary to go back several years, to a time when railway mileage and traffic and the number of employees were all very much less than in 1915, to find accident figures as small as those reported for the year.

Excluding trespassers, the total number of fatalities in connection with railway operation was only 3,537, or less than for any year since 1900, and 27 per cent less than in 1914, while the number of passengers carried one mile in 1915 was approximately 106 per cent greater and the number of tons of freight hauled one mile was about 92 per cent greater than in 1900.

The total number of casualties to persons, according to the commission's bulletin, was 170,661, including 8,621 persons killed and 162,040 injured. These figures represent a decrease as compared with 1914 of 1,681 in the number of persons killed, or

FATALITIES IN CONNECTION WITH TRAIN OPERATIONS FOR TEN YEARS

	Passengers	Employees	Trespassers	Other Persons not Trespassing	Total	Fatalities in Train Accidents Only (included in the foregoing)
1906	418	3807	5381	949	10,555	1093
1907	647	4353	5612	1083	11,705	1464
1908	406	3358	5489	913	10,166	807
1909	335	2456	4944	915	8,650	651
1910	421	3383	*	*	*	932
1911	356	3163	5284	1154	9,957	867
1912	318	3235	5434	1198	10,185	859
1913	403	3301	5558	1288	10,550	849
1914	265	2850	5471	1307	9,893	626
1915	222	1809	5084	1163	8,278	410

* Not reported.

16.4 per cent, and 30,622 in the number injured, or 15.9 per cent, and the total is less than for any other year since 1911. These total figures include 343 employees killed and 99,192 employees injured in "industrial accidents," those not occurring in connection with train operation, but taking place on railway premises, as in shops, etc.

Of the total number killed, 222 were passengers, 2,152 employees, and 6,247 other persons, including both trespassers and non-trespassers, a decrease as compared with the 1914 figures, which were also less than those for 1913, of 43 passengers killed,

or 16.2 per cent of 1,107 employees killed, or 34 per cent, and 531 other persons killed, or 7.8 per cent. Comparisons of the principal classes of railway fatalities for the 10-year period, 1906-1915, are given in the accompanying table, which shows that with the exception of "other persons" and trespassers, the fatalities for 1915 were less than for any other year in the period, while in some cases it is necessary to go back to 1898 to find lower figures. The improvement as to the number injured, while considerable, is less conspicuous, and on account of changes in the methods of reporting injuries the figures relating to them for the various years are not strictly comparable. Of the persons injured 12,110 were passengers, 138,092 employees, and 11,838 other persons, a decrease of 3,011 injuries to passengers, or 20 per cent, of 27,120 injuries to employees, or 18 per cent, and of 491 to other persons, or 4 per cent.

The remarkable improvement shown by these figures is, of course, as already indicated, attributable to a considerable extent to the reduction in the volume of traffic handled during the year, just as increases in accidents in previous years have been due to an increasing volume of business affecting the chances for accidents, a fact not always given proper consideration in discussions of the subject. But the railway accident record has been improving for many years relatively to the volume of business, and in 1915 the improvement was much greater than can be accounted for solely by the decrease in business.

While detailed traffic statistics for 1915 are not yet available, the earnings reports show a decrease in total operating revenues of only about 5 per cent, in freight revenues of about 6 per cent and in passenger earnings of about 10 per cent, as compared with 1914, and the number of employees and the train mileage probably will show a comparable, although somewhat greater, reduction. The gross earnings for 1915 were less than in 1914 or 1913, but were greater than for any year before that time. The freight earnings were less than in 1914 or 1913, but were greater than in any year before. The passenger earnings in 1915 were greater than for any year before 1911.

The total number of persons killed in 1915 was less than for any other year since 1902, and the number injured was less than for any other year since 1911. The total number of passengers killed, 222, out of approximately one billion carried, was less than for any other year since 1898, when only 798,000,000 were carried; and the number injured was less than for any other year since 1906. The total number of employees killed was less than for any other year since 1898, when there were only about half as many employees as in 1915, and the number injured was less than for any other year since 1911. The total number of other persons killed, most of whom were trespassers, was less than for any year since 1910, but the number injured was greater than for any other year except 1914 and 1913.

Railroad conditions are most truly reflected by the number of casualties resulting from train operation, which excludes industrial accidents. This total for 1915 was 71,126, as compared with 89,281 in 1914, a decrease of 20 per cent, and was less than for any other year in the last decade, except 1909, when the volume of business handled was less than in 1915. The number of persons killed in accidents connected with train operation, 8,278, was 16.8 per cent less than in 1914 and was less than for any other year since 1901. The number injured, 62,848, was 20.9 per cent less than in 1914 and was less than for any other year since 1910. Excluding industrial accidents, the number of employees killed was 1,809, a decrease of 36 per cent, or less than for any other year since 1897, and the number injured was 38,900, a decrease of 25 per cent, or less than for any other year since 1899.

As usual, by far the largest class of railway fatalities was that of trespassers, which totalled 5,084. While the number of trespassers killed was less than in 1914, the percentage of trespassers killed to all persons killed was increased from 50 per cent in 1913 and 53 per cent in 1914 to 59 per cent in 1915, and the number of trespassers injured was larger than for any year since the statistics have been compiled. Excluding trespassers, the number of persons killed in railway accidents, including all those for which the railways may be considered responsible, was only 3,537, and represents the remarkable decrease of 27 per cent as compared with the number of persons other than trespassers killed in 1914.

The number of train accidents in 1915 was 11,542, as compared with 15,006 in 1914, a decrease of 23 per cent, and was less than for any other year in the past 10 years, with the possible exception of 1909. This total consisted of 3,537 collisions, a decrease of 32 per cent; 6,846 derailments, a decrease of 20 per cent, and 1,159 miscellaneous accidents, a decrease of 3.4 per cent. The number of collisions was the smallest in 10 years, and the number of collisions and derailments combined was the smallest excepting in 1909, since 1903, while the number of persons killed and injured in collisions and derailments was the smallest reported by the commission since 1902. The number of derailments shows less improvement, but the total for 1915 was less than for any other year since 1911. The total number of persons killed in the 11,542 train accidents was 410, or 34 per cent less than in 1914, and the number injured, 8,362, was 32 per cent less. The number of passengers killed in train accidents was 89, as compared with 85 in 1914, and with that exception was less than for any other year since 1899, although the number of passengers carried one mile in 1914 was 146 per cent greater than in 1899. The total for the two years combined is hardly greater than the average for the past 10 years, which was 164.

SAFEGUARDING SIGNAL CONTROL WIRES

WE have commented repeatedly in these columns on the high degree of perfection to which the performance of automatic signals on American railways has been raised. The ratio of failures to the total number of operations is extremely small, and the vast majority of the improper operations, which are classed as failures, are on the side of safety, resulting from the inherent property of the system to indicate a derangement of any part of the apparatus or circuits by the display of the most restrictive indication.

It should be emphasized, therefore, that the improper clearing of the signal which resulted in the disastrous collision near Rockledge, Tenn., on December 23, as described in another column, represents a class of signal failures which in number is practically negligible, but in importance, is vital. While this accident did not occur under the automatic system, the signal at fault is operated electrically, by a local circuit which is controlled through a track circuit relay, and a line relay receiving its energy from a distant point, in essentially the same manner as in an automatic system. The lesson which is dramatically taught by this accident applies alike, therefore, to controlled manual and automatic systems.

The exact cause of this failure has not been established with sufficient weight of evidence to settle all controversy. Disregarding the points in dispute, however, the main lesson is clear. It has apparently been established beyond contradiction that the failure could have been caused by the accidental contact of one of the energized telegraph wires with the relay control wire of the signal system, the insulation on this wire either having been temporarily removed or seriously damaged by fire. Railway men should know that some of the more important telegraph lines carry considerable current, but the feeling is quite general that a telegraph wire is part of a low-voltage circuit and as such, need not be feared as a source of foreign current which may wrongfully affect the signal apparatus. It is common practice on many roads to place telegraph and signal circuits on the same pole lines, and if any thought is given to the possibility of interference, the insulation on the signal wires is relied on exclusively to prevent "crosses."

Under normal conditions this protection is, of course, ample, but this trying experience of the Nashville, Chattanooga & St. Louis illustrates the vital importance of preventing abnormal conditions. It hardly needs to be argued that direct current

signal wires should be placed on separate pole lines, wherever possible. When alternating current is used for signaling, there is, of course, no chance of derangement from this cause. When not possible or feasible to get a separate line, the most careful provision is necessary against possible contacts under such an abnormal condition as the moving of the pole line. On some roads, special measures have been adopted, one company even going so far as to place all signal wires temporarily in a cable, laid on the ground, during the moving of telegraph lines. This may seem an extreme precaution and it is an expensive one; but if signal circuits are to be maintained on the same pole line with telegraph wires carrying from 100 to 200 volts, there can be no satisfactory feeling of safety except by providing proper construction, rigid inspection and the best of maintenance.

ATLANTIC COAST LINE

THE prospects are that if the directors desire so to do they can conservatively resume the seven per cent rate of dividends on the Atlantic Coast Line common stock, which rate was reduced in 1915 to five per cent. Earnings for the five months ended November 30 were more than $800,000 greater than in the corresponding five months of the previous fiscal year. Furthermore, November showed a larger comparative gain than any of the other five months. An increase of $2,000,000 in net operating

The Atlantic Coast Line

income would just about put the Atlantic Coast Line back on the 1914 fiscal basis of earnings.

In the fiscal year ended June 30, 1915, total operating revenues amounted to $31,536,000, a decrease as compared with the previous year of $5,296,000, or 14.38 per cent. Total operating expenses were $24,493,000, a decrease of $3,280,000, as compared with the previous year, or about 11.81 per cent. Neither the percentage loss in gross, nor the percentage of cut in expenses were as great for the Atlantic Coast Line as for either the Southern Railway or the Seaboard Air Line. For one thing, the Atlantic Coast Line, being a stronger road financially than either of the other two companies, it was not necessary to stop all betterment work. This fact was reflected in a smaller cut in maintenance of way expenses for the Atlantic Coast Line than for the other two companies. On the other hand, both the Southern Railway and the Seaboard reduced transportation expenses in greater proportion even than the heavy losses in gross revenue. The Atlantic Coast Line did not quite succeed in doing this. The loss in revenue was 14.38 per cent, the reduction in transportation expenses 13.93 per cent; total transportation expenses in 1915 amounted to $11,291,000, as compared with $13,118,000 in 1914. This reduction in transportation expenses, however, is a fine showing. The mileage of passenger trains could only be reduced by a small percent, the total mileage in 1915 being 8,313,000, as against 8,563,000 in 1914. There had to be, therefore, a large reduction in freight train mileage. This mileage in 1915 totaled 6,718,000; in 1914, 8,157,000. The average number of freight cars per train mile in 1915 was 29.89; in 1914, 26.90, an increase of 11.12 per cent. The increase in number of loaded cars was 9.08 per cent. The average freight train load was 236 tons in 1915, as against 225 tons in 1914.

The relatively small average train load is due to the fact that so large a proportion of the Atlantic Coast Line's freight falls under the head either of perishable freight, fast freight or local freight. Of the total tonnage carried in 1915, amounting to 10,508,000 tons, 18.88 per cent only was product of mines. The total tonnage of products of mines was 1,984,000 in 1915, as compared with 2,974,000 in 1914. Fruit and vegetables furnished 590,000 tons of freight in 1915, or 5.61 per cent of the total freight tonnage. This compares with 630,000 tons in 1914, or 4.80 per cent of the total freight tonnage in that year. Manufactures furnished 2,236,000 tons of freight, or 21.28 per cent of the total in 1915. In 1914 the tonnage of manufactures was 3,114,000, or 23.75 per cent of the total. Lumber furnished 3,132,000 tons, or 29.81 per cent of the total in 1915; and 3,735,000 tons, or 28.48 per cent of the total in 1914. The lumber industry in the past few years has been at a very low ebb. If the Coast Line gets its share of the increase in lumber traffic which improved business conditions this year should bring—and it usually does get its share of business—the total of this potentially heavy loading commodity will be very much greater in the 1916 fiscal year than it was in 1915.

Maintenance of way and structures cost $4,573,000 in 1915, as compared with $5,117,000 in 1914. Maintenance of equipment cost $5,438,000 in 1915 and $6,095,000 in 1914. This is a decrease in maintenance of way of 10.6 per cent and in maintenance of equipment of 10.8. Total train mileage decreased about 12 per cent, so that apparently there was little or no curtailment of maintenance of equipment. Track labor was much more plentiful and of an unusually high grade, so that in maintenance of way a reduction of 10 per cent in outlay does not necessarily mean any reduction in the amount of work done. There was about the same amount spent for ballast and for ties in 1915 as in 1914, although there was a considerable reduction in the amount spent for rails, the 1915 figure being $210,000 and the 1914 $300,000.

There was a total of $1,590,000 spent for additions and betterments. The three largest items of expenditure were $282,000* for rails, $229,000 for station and office buildings, and $229,000 for shops and engine houses. There were $2,645,000 general unified 4½ per cent series A bonds issued during the year, and the total of mortgage bonds per mile of mortgaged railroad is now at the rate of $26,574 per mile.

At the end of 1915 the Atlantic Coast Line had $11,380,000 cash, with no loans and bills payable and with the total current assets of but $6,300,000.

The following table shows the principal figures for operation in 1915, as compared with 1914:

	1915	1914
Average mileage operated	4,689	4,646
Freight revenue	$21,064,188	$24,825,313
Passenger revenue	7,853,539	9,212,170
Total operating revenues	31,536,475	36,832,780
Maintenance of way and structures	4,572,651	5,116,944
Maintenance of equipment	5,438,461	6,094,706
Traffic expenses	661,514	649,821
Transportation expenses	11,291,110	13,118,266
Miscellaneous	110,547	.....
General expenses	880,377	1,232,351
Transportation for investment—Cr.	50,502	.....
Total operating expenses	22,904,157	26,212,088
Taxes	1,589,157	1,561,159
Operating income	7,029,114	9,049,893
Gross income	10,333,861	13,105,935
Net income	4,313,281	7,338,846
Dividends	3,437,735	4,808,957
Surplus	875,546	2,529,889

* This amount is for additional weight of rail used in renewal over and above the weight of rail replaced and for rails laid in new second track or sidings.

Letters to the Editor

THE ANTIQUITY OF THE JITNEY

ANN ARBOR, Mich.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

An interesting illustration of the adage that "there is nothing new under the sun" is furnished by the following quotation from the Scientific American of January 17, 1852. After reviewing the possibilities of using "steam carriages" on the "McAdam" and plank roads then building, the editor dismisses the subject with—

Could a steam carriage carry passengers at a rate of two cents per mile? At the present moment (horse-drawn) stages run in opposition to a railroad between Albany and Troy (six miles) on a macadam road for two cents per mile.

In a later issue of the same year, April 10, 1852, appears a notice of a stage line started in opposition to the railroad between Jersey City and Newark, on which the fare for a nine-mile ride was 12½ cents, half the regular railroad fare, and the same as the canal toll.

Thus we see that the jitney is an ancient institution. Equally interesting, perhaps, is the inference which may be drawn as to the developments in drivers' wages and in the speed and luxury of commutation service.

J. E. BAKER.

THE FUEL DEPARTMENT

BLANK, Pa.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

We note an article on the fuel department in the *Railway Age Gazette* for November 19, which from a practical standpoint seems to offer grounds for argument.

Considerable stress is placed on having the fuel department isolated from the other operating departments and at the same time so connected with them as to be in a position to control and supervise their fuel consumption. Importance is also attached to the so-called "individual record" scheme as a factor in fuel economy. While it is not our desire to belittle in the least any attempt to conserve fuel, it would seem that the application of these theories to practice would be very difficult in many cases.

Within the past year the writer has been in a position to study closely the various fuel-saving schemes adopted by many railroads in the territory east of the Mississippi river. Many of these seemed to be based on ideas along the lines advanced in the article referred to; while the general agitation of the fuel question has undoubtedly resulted in fuel economy, it was noticed that in the majority of schemes theoretical lines were followed very closely and while proper comparisons with the previous year showed fuel savings based on a ton-mile of freight hauled, exceptions could be taken. One especially noticeable feature was that the entire savings were credited to the fuel department and the individual fuel record, while undoubtedly the application of superheaters, brick arches, not to mention the adoption in many cases of heavier power, must have been responsible for a considerable part of the economies.

Why is it necessary for this fuel department to have full authority over the operating department, even in details which are normally supposed to be handled by the division authorities. Evidently this is the intended course, as it would hardly be possible to have fuel instructors on the same division, one reporting to a fuel supervisor who would be a general staff man, the other reporting to the road foreman. Often, too, the fuel departments duplicate supervision and unless the division authorities are broad minded friction results to a more or less extent.

It must be admitted by all that a fuel department fully warrants the expense incurred. The fuel supervisor should have charge of the buying, or at least direct the purchasing agent as to the buying. He should have charge of the inspection and distribution to the coal wharf and also look after the instructions to the division supervisors. At this point his work should end and that of the division authorities should begin.

The fuel supervisor should have charge of examining and instructing the men selected by the division authorities for road supervisors. This instruction should be standard and the examination sufficiently thorough to show that the candidate is not only grounded in the practice of firing and engine operation, but is well able to impart the information in a plain and diplomatic manner.

These road foremen and instructors should be selected carefully with a view to handling the situation and effecting a maximum saving if they are furnished in sufficient numbers. These men must be kept on the road supervising road operation and should not be required to devote a large part of their time to office work or special work. One supervisor to every fifty engines is generally regarded as sufficient. This number is not maintained on many roads, because of the expense. To make up for this lack in the general supervision the theoretical end is called upon, usually in the nature of the individual fuel record.

Considerable importance is placed by many on the individual fuel record and great claims are made as to its value. It is noticeable, however, that in the face of retrenchment the record and its attendant expense is eliminated while the road supervision remains unchanged. The individual record is not to be entirely condemned, for on many roads its introduction has been followed by a general agitation of fuel economies usually followed by an increase in road supervision.

For the same reason, however, that the coal premium system was abandoned, just so is the individual record weak. The intrinsic value can only be established when the power is assigned and track scales are provided for weighing tenders inbound and outbound. Even with these features provided there must be some positive method of requiring crews to take the kind of interest that results in economy, and this interest can only be furnished by discipline in one form or another when the fuel consumption is above a predetermined point.

In conclusion, the following general scheme is offered for consideration; many of the features are the same as offered by Mr. Plant, although some additional ideas are suggested:

There should be a general fuel supervisor reporting to the general superintendent of motive power—this supervisor to have charge of the preparing of specifications, both physical and chemical, under which all fuel must be purchased. He should have charge of a corps of mine and traveling inspectors whose duties should be to know that fuel is being furnished according to specifications. The instructing and examining of men selected by the local authorities should be in his hands and he should prepare standard instructions which would be followed.

In determining the ability of candidates for positions as local supervisors actual road tests should be run for both firing and engine operation and the men should be required to furnish instruction while being observed by the general supervisor. Too much stress cannot be laid on this standardization of instruction on the road tests in order to determine the fitness of the candidate. A man who, when the pressure keeps on the downward move, can say, "Let me have her a while, Bill," and at the end of ten minutes hands the shovel back to the fireman with the remark: "You had too much coal in front and had better put a little more along the sides," is the man whose instructions will be followed. An average division should be selected as a proving ground and over this division comparative tests should be made to determine the value of the different fuels; this same division will serve as a school ground for the embryo supervisors.

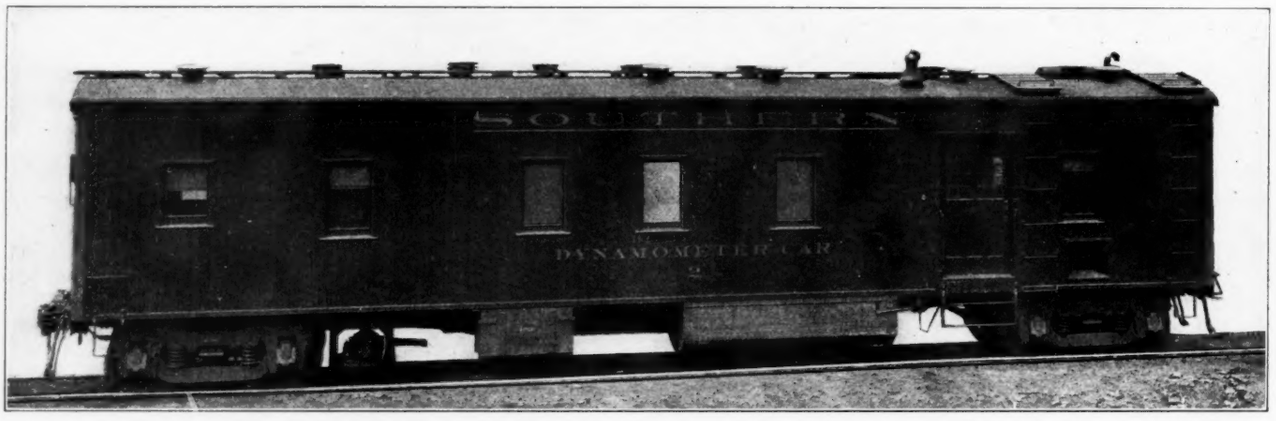
A road foreman should be provided for each superintendent's division, who should be in direct charge of the road supervisors. These road men should also be furnished with forms upon which can be shown certain information relative to the performance of the crews with whom they ride; any instructions which are given should be noted. These forms can then be filed as a permanent record of the man instructed and will also serve as a measure of the efficiency of the instructor.

E. WALTON.

Southern Railway High Capacity Dynamometer Cars

Buffing Capacity, 800,000 lb., and Pulling Capacity, 200,000 lb. Seventeen Records Have Been Obtained

The Southern Railway has in service two dynamometer cars, each having a registering capacity of 200,000 lb. draw-bar pull and 800,000 lb. buffing force. The cars are 50 ft. long by 8 ft. 10 in. wide inside, the dynamometer room at one end of the car being 15 ft. 2 in. long. The rest of the car is divided into compartments for housing the testing crew, there being one upper and three lower berths, an office with a sofa berth, a room for the porter, and a kitchen equipped with a range, refrigerator, etc. The car is heated with hot water from a Baker heater. A special observation window is placed in each side of the car in the dynamometer room. This window projects 7 in. beyond the side of the car, so that the observer may readily see the approaching landmarks. Directly below this window is the mile-post light box set into the car at such an angle that the light may be thrown sufficiently far ahead for the observer to discern the landmarks as they are approached in the dark.

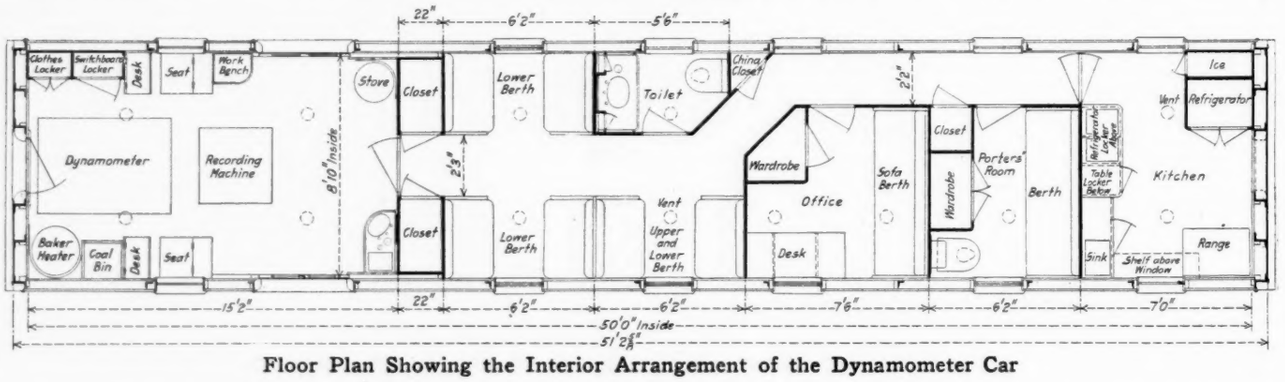


Dynamometer Car for the Southern Railway

The underframe is of the built-up type made of structural steel shapes. The center sill is a box girder of the fish-belly type, with bottom plates only at the cross-bearers and bolsters. It extends from the end sill at the kitchen end to the body bolster at the dynamometer end of the car, the dynamometer rigging being installed between the bolster and the end sill. Two intermediate sills of 7-in., 19.75-lb. channels extend between the cross members of the underframe for the full length of the car. At the dynamometer end 13-in., 32-lb. channels, located 18½ in. each side of the center of the car, extend between the end sill and the body bolster to take the place of the center sill, which terminates at the body bolster.

The side sills are 6-in., 15.6-lb. Z-bars, and extend the full length of the car. Three built-up cross bearers are used, one at the middle of the car and one 10 ft. from the middle toward each end. The webs of the cross bearers are fastened to the web of the center sills by 6-in. by 6-in. by ⅜-in. angles. A 13-in., 32-lb. channel is riveted between the webs of the center sill at each cross bearer. The body bolsters are of the double-built up type, spaced 8 in. between webs. At the dynamometer end a ⅝-in. cover plate extends back from the end sill 9 ft. 3 in. for the full width of the car, and immediately back of it is another plate of the same material, 4 ft. 9 in. long. This provides a substantial base for the recording table. The end sills are 12-in., 32-lb. channels.

The framing is made principally of steel shapes, 2½-in. by 2½-in. by ¼-in. angles being used for the side posts and diagonal braces and 6-in., 15.6-lb. Z-bars for the corner and end posts. The side plates are 3-in. by 3-in. by ⅜-in. angles, and the end plates are 4-in. by 3-in. by ⅜-in. angles. The carlines are made up of two 2-in. by ⅜-in. bar iron straps, between which is bolted a strip of wood 2½ in. by 1¼ in. to which are nailed the purlins and the car ceiling. The straps are flanged and riveted to the side plates. The flooring consists of a layer of 1⅛-in. and a layer of ¾-in. boards, between which is placed a layer of ⅛-in. felt paper.



Floor Plan Showing the Interior Arrangement of the Dynamometer Car

Dynamometer Transmission

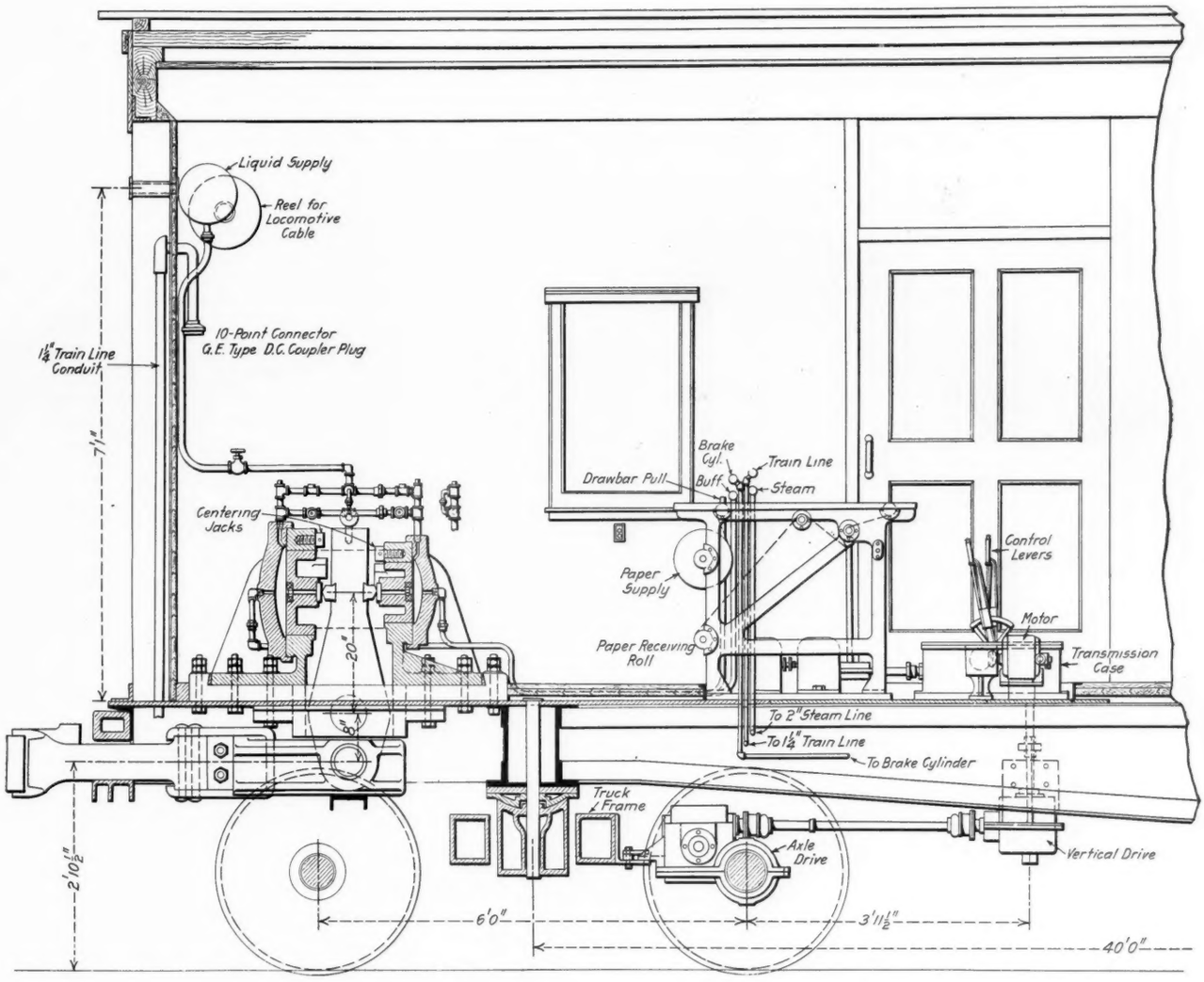
The dynamometer mechanism is driven from the rear axle of the leading truck, to which is keyed a 36-tooth gear. This drives

another gear of the same size, which runs on a splined jack shaft, the entire mechanism being enclosed and running in an oil bath. By shifting this gear in and out of mesh with the axle gear, the dynamometer mechanism is thrown in and out of action. A worm on the jack shaft engages with a worm wheel which drives the main shaft, the shaft being fitted with universal and slip joints to accommodate the movement of the truck. The drive is carried to the transmission case through bevel gears. A right and left spring ratchet clutch at the head of the vertical driving shaft in the transmission case provides a constant direction shaft to the paper, regardless of the direction in which the car is traveling. Provision is also made for cutting out the axle drive and cutting in the motor drive, a 32-volt ¼ h.p. motor running at 1,200 r.p.m. being used for the purpose. The transmission gears provide three speeds of paper travel, which are 1/16 in., ¼ in. and 1 in. per 100 ft. of car travel when driven from the axle, and 3¾ in., 15 in. and 60 in. per minute when driven by the motor. The transmission gears are lubricated by a continuous bath of oil.

On the end of the transmission case is a shaft, rotating in proportion to the car travel, on which is mounted a timing device giving a distance contact for each 25, 50 and 100 ft. travel of the car. The truck wheels that are used to drive the mechanism are turned to a definite circumference and are without brakes for the purpose of eliminating the wear due to the brake-shoe friction. A wear of ⅜ in. on the radius is permissible, the wheels having 3/16 in. excess radius when new to maintain maximum average accuracy in service.

Dynamometer

The dynamometer itself is of special interest due to the large capacity combined with the exceptionally small space it occupies in the car and the compactness of the whole arrangement. It is a new design of the diaphragm type. The coupler is rigidly connected to the bottom of the dynamometer lever, the connection being about 3 ft. back of the end sill. The dynamometer

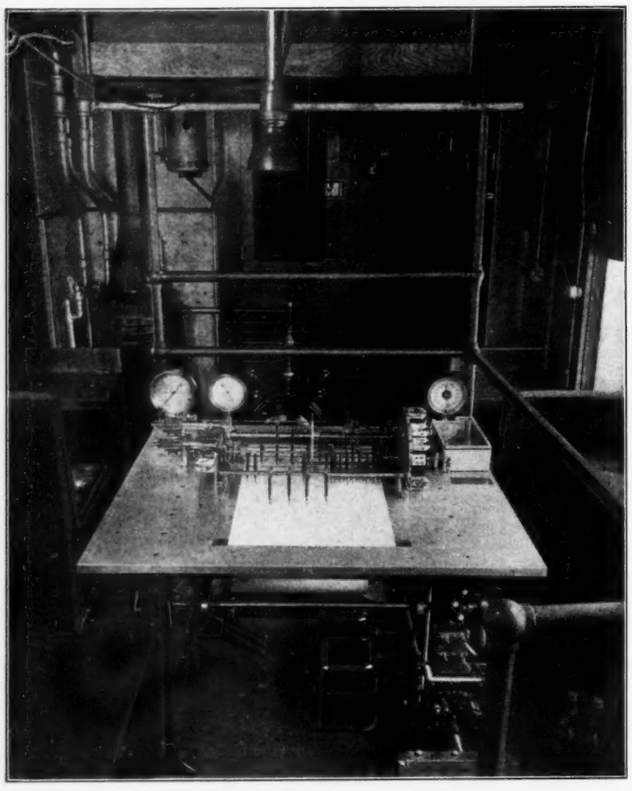


Arrangement of the Dynamometer and Recording Mechanism

lever itself is pivoted on a 5¾-in. pin, which bears on six hardened steel pins inserted in the bearings to reduce the friction. The leverage ratio is 8 to 20, as indicated in the illustration.

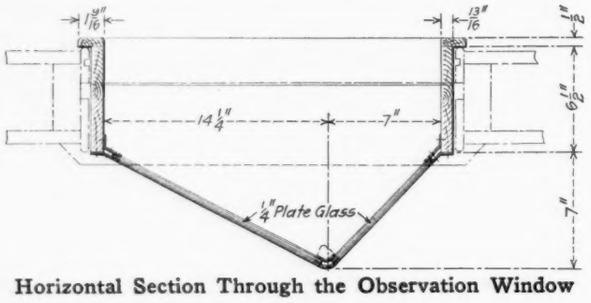
The coupler has a free up and down movement, but no sideways motion is permitted in this construction. The upper end of the dynamometer lever is provided with knife edges, which bear on pistons on either side of the lever for recording the buffing and pulling forces. Both the pistons are suspended on knife edge hangers and float in the cylinders, there being a clearance of 1/64-in. between the pistons and the cylinder walls. The buffing piston has about 160 sq. in of surface and is designed for 2,000 lb. per sq. in., which will give a maximum buffing capacity of 800,000 lb. The piston for recording the pull has 80 sq. in. of surface, which with a working pressure of 1,000 lb. per sq. in., gives a maximum pulling force of 200,000 lb. With these high

fluid pressures a correspondingly increased sensitiveness is obtained. Inasmuch as a movement of only .006 in. is required to give the maximum record of drawbar pull, the effect of friction is very slight and the inertia effect of the heavy parts



Interior of the Southern Railway Dynamometer Car, Dynamometer End

is practically eliminated. A mixture of alcohol and glycerine is used as the pressure medium between the dynamometer and the indicator. Jack screws inserted in the housing of the dynamometer are used to lock the pistons in mid-position when it is

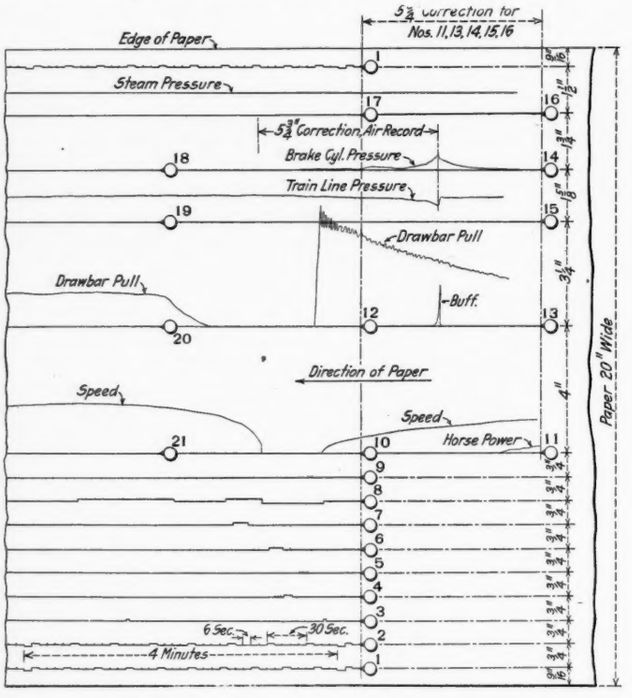


Horizontal Section Through the Observation Window

desired to replenish the supply of pressure medium in the dynamometer cylinders. The medium is carried in an overhead tank and flows to the cylinders by gravity. The base of the dynamometer itself occupies only 4 ft. 6 in. by 2 ft. 11 in. floor space.

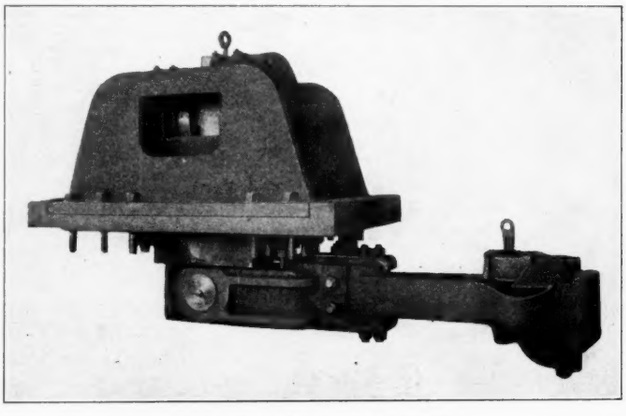
Recording Table

The recording table is a semi-steel structure with an aluminum top. Provision is made for the operation of 21 pens, which are distributed in three rows; the first row contains four datum pens, the second row contains the pens for registering the distance, integrator records, drawbar pull, speed, throttle position, curves, indicator cards, reverse lever position, coal fired, mile posts and the time. The last row contains the pens for steam pressure, train line pressure, brake cylinder pressure, buffing force and horsepower. A correction of 5¾ in. must be allowed between the second and last row of pens. The table is designed for paper 24 in. wide, although 20-in. paper is used. On the table is mounted the integrator, which gives a continuous record of the area under the drawbar pull curve. This instrument is of



A Section of the Dynamometer Chart Showing the Arrangement of Recording Pens

simple construction and is accurate to within a fraction of one per cent. It consists essentially of a flat steel disc with a carefully polished surface, which is revolved at a speed proportional to the paper speed, the ratio being 1½ in. of paper travel per revolution of the disc. A small hardened steel wheel similar to the ordinary type of integrator wheel is carried in a light frame and rests normally at the center of the disc, being moved from its central position by the action of the drawbar pull indicator.



Dynamometer and Drawbar

Thus, for any distance traveled the number of revolutions of the integrator wheel will be proportional to the product of the paper travel equivalent to the given distance and the average value of the ordinates of the drawbar pull curve. One revolution of the integrator wheel is equivalent to 6 sq. in. of area under the drawbar pull curve and each revolution is recorded on the paper.

The horsepower computer is also located on the top of the table at the right, just in front of the speed gage. It is a mechanical multiplying machine operating on the triangulation principle, multiplying the ordinate of the drawbar pull curve

by a speed value obtained from the Boyer speed recorder. The product, or the horsepower, is recorded on the chart. Ordinary electro-magnets are used for actuating the pens where only offsets are desired. Outside spring Tabor indicators are used for recording the buffing force, train line pressure, brake cylinder pressure and locomotive steam pressure. A special indicator is used to record the drawbar pull, which has a maximum travel of 6 in. Its cylinder has a sectional area of ½ in. and the plunger has a travel of 1 in. All electrical circuits are controlled by the table operator and are located directly beneath the top of the dynamometer table at the right hand of the operator. Adjacent to the table is the transmission case with its two controlling levers mentioned above, which also may be conveniently reached by the operator. The recording table is equipped with suitable mechanical drives for the accurate driving of the paper.

The electrical circuits that are operated from the locomotive are contained in a cable which runs from the dynamometer car over the tender to the locomotive, this cable containing 10 different circuits. When not in use the cable is wound on a reel just inside the car. The car is provided with an axle lighting system.

The car bodies were built by the Lenoir Car Works, and all the dynamometer equipment was furnished and installed by the Burr Company, Champaign, Ill.

ANNUAL REPORT OF I. C. C. SAFETY DIVISION

The Interstate Commerce Commission has issued a pamphlet of 45 pages containing the report of H. W. Belnap, chief of the division of safety, for the fiscal year ending June 30 last and containing also extracts from that portion of the report of the commission itself, heretofore noticed, dealing with this department of the work. The present report is dated December 1. In the last fiscal year the inspectors of the commission, the number of whom has been increased, examined 1,000,210 freight cars, or nearly one-third more than in the year preceding. The percentage found defective was 4.77, which is considerably less than in the preceding year; but the percentage of passenger cars found defective, 2.85, is very much larger than in 1914, when it was 1.04. This is explained by the fact that the extension of time granted by the commission for bringing passenger cars up to the standard prescribed by the government expired on July 1, 1914.

The inspectors continue to find a diversity in kinds of car couplers, some of doubtful efficiency, and a general lack of efficiency in uncoupling mechanism, which constitute the reason for a large part of the defects which are found. If uncoupling chains could be made efficient, the chief cause for prosecution of railroads for violation of the law in this matter would be done away with.

The report commends railroads which maintain standards requiring 100 per cent efficiency in the operation of air-brakes; but the great majority of the roads continue to act on the assumption that if 85 per cent of the cars in trains have their power brakes operative, the requirements of the law are met. Suits have been instituted to test the law and to make the carriers understand that the spirit of the act aims at 100 per cent brake power, and requires that the brakes on all air-brake cars shall be used. The railroads are employing a better class of inspectors of cars—men who are more thoroughly acquainted with the complicated apparatus of the air-brake system; but many roads are still lax in their observance of the strict requirements of the law at interchange points, largely because their inspectors are not sufficiently familiar with the detail of the law. Also, many roads make trouble in this matter by neglecting to carefully inspect cars before offering them to a connecting line. The report commends several roads which have general traveling inspectors whose activities promote uniform practice. Attention is called to the fact that when a road is prosecuted for violating the safety-appliance law, the case represents general neglect; the government does not prosecute isolated instances of failure to comply with the law.

Hours of Service

The number of instances reported of men working beyond the time prescribed in the law was 78,940, as compared with 165,305 in the preceding year. There is a list of causes contributing to cases where employees in the train service were on duty longer than 16 consecutive hours, which shows a great reduction. For example, in 1913 the number was 261,332; in 1914 it was 131,332 and in 1915 it was 59,373. The largest reductions were in cases caused by drawbar failures, locomotive defects, hot boxes, and other delays which are likely to occur in the operation of any train. There is still a good deal of carelessness on the part of the railroads in making reports under this law, and it is recommended that a penalty be provided for each omission by a carrier from its monthly report of instances of excess service performed by employee. The report says that carriers co-operate heartily in furnishing all information desired by the government inspectors.

Investigation of New Inventions

Of 418 devices presented for consideration, 342 have been examined. Of this number 251 were worthless, and 35 possessed some merit. Reports have been sent to Congress during the year on the Grey-Thurber automatic train stop, tried on the Pennsylvania, west of Pittsburgh, and the Jones apparatus, used on the Maryland & Pennsylvania Railroad. Arrangements have been made to test the devices of B. F. Wooding, Denver, Colo., and of the Gollos International Automatic Train Control & Recording Company, Chicago. The last named has been installed for experiment on the Chicago, Burlington & Quincy, near Aurora, Ill.

Arrangements have been made for testing on the Atchison, Topeka & Santa Fe. an automatic straight air-brake system presented by the California Valve & Air Brake Company of Los Angeles. This system employs an additional reservoir on each car, a triple valve operated by diaphragms, and a valve on the locomotive to compensate for train line leaks; it is designed to provide greater efficiency and flexibility in the operation of train brakes, and to provide a "straight air" feature by supplying air directly from the main reservoir to the brake cylinder when the train line pressure has been reduced below the point of equalization.

The report contains brief notes of 15 devices of various kinds, the descriptions of which as presented to the Commission, indicate some merit. In some instances the prorietors of train control devices, after having received tentative approval for tests under actual service conditions, have evinced unwise and unnecessary haste in making installations and preparing for the tests. Either the apparatus itself has been crudely built and not properly installed or, after the installation has been completed, it has not been thoroughly tested by the proprietors before turning it over to the government. It is not reasonable, says the report, to expect that under such circumstances results entirely favorable to the device or system tested will be attained.

Discussing the necessity for the use of automatic train stops the report says that during the year under review no serious accident was investigated which was due directly to the failure of an engineman to observe and obey signals. The report says that the increase in the use of the block system has not kept pace with operating conditions created by increased traffic.

Railroads on which 500 or more cars were inspected during the year are shown in a table giving causes of defects found; and there is a similar table giving information of terminal tests of air-brakes. Another table, No. 4, shows the condition of safety appliances on the freight cars of a few representative railroads, illustrating the prevailing general conditions in each of the last five years. This table gives, for each road shown, the number of cars inspected, the number found defective, and the percentage found defective.

Importation of Coal into Switzerland.—The imports of coal into Switzerland reached a total of 1,969,454 tons in 1913 and a total of 1,697,251 tons in 1914.

SOME SUGGESTIONS FOR THE IMPROVEMENT OF THE RAILROAD SITUATION

By W. J. Moroney
Dallas, Tex.

The recent message of President Wilson calls forcible attention to the importance and urgency of our transportation problems, and invites suggestions from all intelligent sources. The message is timely. Those who already have railroad investments are most directly interested, and doubtless, as a rule, they are also the best informed, but it is also a public matter, and it would be wise for railroad men to consider the public point of view, because public opinion, whether it be right or wrong, will inevitably dictate the final judgment. It is as a member of the general public that I offer the following suggestions for consideration. From my means of information it seems that among the gravest railroad problems are the following:

Some of the Present Problems

How to encourage and protect needed railroad investments? On this point I think that profits should not be limited by law or regulation unless such profits are also guaranteed in some substantial way. In private lines of business the investor who takes all the chances is permitted without question to secure all the profits he can get legitimately. There is scant incentive for efficient and economical management, and there is strong temptation for concealment and manipulation, as long as the general view prevails that the investor should take all risk of loss, and that all discoverable profits in excess of a small percentage shall be sequestered by public authority. Indeed, as long as such a view consciously or unconsciously influences public policy in an appreciable degree, it will, in like degree, be difficult to induce new capital to seek railroad investments.

How to prevent undue inflation of railroad securities, and at the same time give the investor who takes the risk a just opportunity to receive compensation for such risk? This is another way of stating the first question.

How, in a progressive way, to make sane provisions for preventing accidents and regulating traffic, and at the same time avoid the unreasonable, impracticable and frequently conflicting or illegal police laws, ordinances and other local regulations on this subject?

How to give just and prompt compensation for personal injuries and property damage, and at the same time reduce the enormous waste and inequality resulting from our present system—or lack of system?

How to make just provision for adequate service and compensatory rates, and at the same time prevent unjust discrimination between persons, places and commodities?

How to prevent railroad strikes and at the same time give just protection to railroad employees?

How to provide for a just and stable system of taxation of railroads and railroad securities?

These are among the most important branches of the general problem that have in various ways come to my attention. They are closely related, and should be considered together. I think that the common habit of looking at merely one phase of the general subject as if it were isolated is one potent reason for the unsatisfactory progress we have made.

An even greater difficulty, perhaps, has arisen from divergent views as to the respective functions of the national and state government, the struggle to apportion these functions between national and state commissions, and the vast amount of uncertainty, inconsistency and obscurity that has thus arisen. I have been trained as a state rights Democrat, but for some time my mind has been tending strongly toward the conclusion that the only substantial hope of proper and permanent relief is to be found in vesting practically exclusive jurisdiction over the more important features of the whole subject in some properly constituted federal authorities, and superseding all conflicting and more or less independent state authorities. I am the more impressed with the probable soundness of this view because I have reached it slowly and reluctantly.

The subject should be considered both as a question of constitutional law, and as a question of sound business and public policy.

It seems to me that recent decisions of the United States Supreme Court substantially establish the proposition that under the constitution of the United States the Congress may legislate on this subject as comprehensively as it may deem proper, even to the extent of practically occupying the entire field, perhaps with some minor exceptions that do not appear to affect the main problem materially, that the jurisdiction to regulate interstate *commerce* includes the jurisdiction to regulate interstate *carriers*, —and all railroads, big and little, and in fact, intrastate carriers; that while Congress has no direct authority to regulate intrastate commerce, as such, it has authority to regulate the relations between interstate and intrastate commerce, which amounts, in practical effect, to much the same thing; and that state and municipal laws, orders and regulations are valid only to the extent that they lie outside the field of federal law or authority, and not in conflict with such law or authority. This seems to me to be the general effect of what has been decided, and my further suggestions will assume the correctness of this view of the powers of Congress under the constitution.

In applying this view it is necessary to consider what laws should be passed, and what machinery to execute and administer such laws should be constituted. On this general subject I make the following suggestions:

Suggestions for Improvement

(a) An interstate commerce commission, and as many district commissions as may be thought proper; the Interstate Commerce Commission to have original jurisdiction in matters of national interest, and appellate jurisdiction and general supervision, as far as deemed proper, in matters of more or less local interest, no attempt at exact definition now being made; but in working out the details I would borrow suggestions, as far as applicable, from our system of federal courts and federal reserve banks, having one supreme central authority and as many local authorities as may be thought necessary, but all to constitute harmonious parts of a single system. I do not think that the Interstate Commerce Commission can alone discharge all the duties contemplated in a satisfactory manner, and I think that it would be much more satisfactory to the general public to have permanent and easily accessible district commissions whose members would be more familiar with the needs and problems of their respective localities.

The proposition contemplates the exercise by federal commissions of practically all the important functions of state commissions, that the latter would therefore probably go out of existence, although various state commissioners would no doubt be appointed on federal commissions, and the final result would thus be a reduction in the present volume of machinery. To what extent and in what manner provision should be made for court review of commission orders, and orders of state or local authorities in alleged derogation of federal rights, is a matter that, of course, should be carefully considered, but concernig which I will not now make any definite suggestions. It should be frankly avowed that the proposition contemplates the concentration of practically all important railroad legislation in Congress, to the practical exclusion of state and municipal legislative bodies, except in minor matters. However startling this suggestion may appear on first blush, I can think of no practicable half-way measure, although perhaps the national laws may properly recognize certain local laws, as our national bankruptcy law expressly recognizes state exemption laws.

It is not my present purpose to go into the refinements of a discussion of the conflicting theories of the nature of our institutions, but I consider it safe to say that in the distribution of powers between the national and state governments it was not the intention that any powers of government should be lost or impaired, and it was the intention that the powers vested in the

national government, either directly or by rational implication, should be supreme. I also think that the best way to preserve and strengthen local self-government is to relieve it of the burden of functions it cannot adequately perform.

In order to care for the great and increasing volume of business, it has been suggested that the membership of the Interstate Commerce Commission be increased, and that it be divided into branches. This proposition would unnecessarily centralize all administrative authority in Washington, and in other respects also I think that it would be unsatisfactory, although it might be well to provide that members of the Interstate Commerce Commission may be assigned to sit with district commissions. I have suggested centralization of legislative authority in Congress because this seems to me to be necessary; but complete centralization of administrative authority is not either necessary or desirable and therefore I do not favor it.

(b) Provision for federal charters for rail and water carriers, with authority to acquire, consolidate and extend existing lines under the supervision of the proper district commission, or of the Interstate Commerce Commission when the lines extend into two or more districts, the proper commission also to have supervision over the issuance of securities. Something of this character seems necessary. The act of Congress would supersede all local laws regulating the sale, consolidation or extension of roads that might obtain a federal charter; and in the same connection complete and exclusive provision could be made for taxing such federal corporations and their securities, with such recognition of local systems of taxation and local authorities as may be thought advisable.

(c) All personal injury claims, whether by employees or others, that are not amicably adjusted, to be presented to and adjudicated by the proper commission, with such provision for court review as may be thought proper, but otherwise no suit for personal injuries to be maintainable. Whether or not injured employees should be compensated according to prescribed schedules is a closely related but different question. It is also worthy of consideration whether or not similar rules should be prescribed for settling property damage claims, freight claims, etc. I assume that, as a rule, such claims would be heard in the first instance before an examiner, and that the principal function of the commission in such matters would be to pass on objections, if any, to the examiner's reports. Such a system, properly administered, should be a great relief to the railroads, greatly expedite the payment of just claims, and in reducing litigation it would be a great relief to the courts and to the taxpayers who maintain the courts. Each commission should have authority to appoint as many examiners as necessary to secure the prompt and proper dispatch of business. The question of payment of costs and expenses is an important matter of detail that I do not overlook, but I will not stop now to discuss it, except to say that there should be a great reduction compared with the costs and expenses now incurred in such matters. To what extent, if at all, it would be desirable, or necessary under the constitution, to provide for trial by jury, is a question that should be carefully considered. I think it will be found that in determining for what and to what extent federal corporations should be liable, and how any such liability shall be established, the powers of Congress are very broad, and not limited by the common law, but I will not discuss that question now.

(d) The commissions to have authority to prescribe such safety, traffic and other police regulations, consistent with the acts of Congress, as may be thought proper, such rules and regulations to supersede conflicting local laws, ordinances and regulations on that subject.

(e) All employees in operating departments, including engineers, firemen and telegraph operators, to be considered in public service, much like soldiers and seamen, with no right to strike, or to resign before expiration of term of employment without employer's consent, adequate penalties to be provided for violation of such law, but the commissions to have the right, and it to be their duty, to redress all grievances of such employees, including the right to fix wages, hours of service, etc. The purpose is to abolish railroad strikes and all occasion for them. It is highly important that such employees shall receive proper compensation, and that their efficiency shall not be impaired by overwork, but the equities of stockholders, shippers and the traveling public should also be considered, and the commissions would be in the best position to give proper weight to all these considerations. It is not the purpose to abolish or antagonize labor unions. The proposition contemplates a species of compulsory arbitration in which the views of employees could be presented through their unions better, perhaps, than in any other way. I have never seen my way clear to accept the doctrine of compulsory arbitration of labor troubles in strictly private industries, but I can think of no better way to meet the problem when public utilities are involved. And a decision should be binding on both sides, with adequate means to enforce it. Legislation is not needed to provide for mere argument, persuasion and attempted conciliation.

The foregoing general suggestions have been prepared for submission to the critical judgment of various gentlemen who have had occasion to consider the subject carefully. I will appreciate any criticisms, and especially criticisms that point out actual or probable objections. No doubt in the light of intelligent criticism some of my suggestions can be improved; and perhaps others should be abandoned. This is a mere outline, and much will depend on how the details are worked out. As a whole these suggestions will probably be considered radical by some conservative people, but I am convinced that nothing short of radical treatment, in the sense of thorough and comprehensive treatment, will be of much service. I have not discussed the current criticisms of railroad management and financing, although I have had such criticisms in mind; but, without intimating any opinion on the justice of such criticisms, I have undertaken to direct attention to the importance of providing for the present and the future as far as we may have the wisdom to do so. No matter how carefully we may legislate the human element will always be present, but I believe that comprehensive and intelligent legislation along the lines here suggested would strongly tend to prevent really objectionabe practices. I have not discussed the peculiar problems of water transportation. That subject is so large in itself as to deserve separate treatment, but of course it should be kept intelligently in mind when dealing with any branch of the general transportation problem.

Since the foregoing was written the newspapers report that the Interstate Commerce Commission has definitely recommended that it be authorized to sit in branches, or subdivisions. Any recommendation from such a high authority is of course entitled to the most careful and respected consideration, and perhaps, as a temporary expedient, this recommendation should be adopted. However, as a permanent remedy, I have little faith in this suggestion. I prefer one supreme commission, sitting as a unit, and as many permanent district commissions as may from time to time become necessary. In other respects, so far as the newspapers report, the recommendations of the commission appear to be largely in line with my suggestion, although not going nearly as far as I do. Perhaps, however, the members of the commission may feel that suggestions for a reorganization of the entire system should come from others, and therefore, in the absence of a definite expression on the subject, it is not to be inferred that they would advise against such a reorganization. At any rate I believe that the time has come to go thoroughly and courageously to the bottom of all phases of the subject, prepared to revise any present views that may not stand such an examination. That, I understand, is in substance what President Wilson recommends in his recent message to Congress.

CHANGES IN ENGLISH RAILWAY SERVICE.—On January 1 the London & North-Western made a number of changes in its train service with a view to securing economy of operation. One important change was an addition of 10 minutes to the schedule time of the London-Birmingham two-hour express.

SAFETY FIRST IN MOTION PICTURES

"The House That Jack Built," the New York Central's second and latest safety-first two-reel feature photoplay, shows in its most realistic scene an actual train wreck, in which, as a result of "short flagging," a heavy freight train crashes into the rear of another train, completely demolishing a coach and two other cars and causing (apparently), the death of two men therein. The motion picture has been produced under the direction of Marcus A. Dow, general safety agent, and like "Steve Hill's Awakening," will be shown to employees of the New York Central in the "safety-first car." It will also be shown at safety

Collision Scene

rallies and in motion-picture houses at important railroad centers, and also probably by the safety committees of other roads.

The title of the story is taken from the Mother Goose rhyme, and as the play is shown, the lines of the verse are cleverly intertwined with the scenes. The story, in brief, is as follows: Jack Foster, a brakeman, and a man of fine character and appearance, has saved his money to build a house. The opening scene shows him with his wife and two little children gathered around a Christmas tree, talking over the prospects of moving into their new home, the building of which is nearly completed. Jack,

Mrs. Foster Overhears Donovan's Story

although a man of good habits, is careless in his work as a brakeman. Jim Stevens, a conductor, and one of his closest friends, on several occasions takes him to task for this, and shows him pointedly wherein he should correct his actions. Jack refuses to join in a game of cards; Jim declares that Jack must refuse not only to gamble for money but to take chances on losing his life. Later, while Jack and his family are showing the nearly completed house to Stevens, Mrs. Foster overhears the conductor tell Jack that sorrow will some day cross the threshold of that home if he does not stop risking life and limb. Mrs. Foster naturally becomes greatly alarmed over her discovery that her husband is careless.

One afternoon after they have moved into the new home, the matter gets on her nerves to such an extent that she sees in her imagination a collision due to her husband's failure to go back far enough with the flag behind his train which has become stalled. This is shown most realistically, and the woman becomes hysterical as the vision passes before her. In the earlier scenes it had been shown that happiness was "the malt that lay in the house that Jack built." It is now shown that carelessness is the "rat that was eating the malt," etc.

At this point the noon whistle blows and Mrs. Foster, with mixed feelings of anxiety and haste, wraps up a pie to take to the yard for Jack to eat with his luncheon. She arrives in time to overhear Donovan, another employee, tell the story of losing his leg because his mind was occupied with thoughts of a quarrel he had just had at home. As the story is told the action on the screen shows Donovan being knocked down by an engine and his leg cut off. Later, Stevens, the conductor, induces Jack to attend a safety rally. Here Mr. Dow shows a picture within a picture; the observer sees motion pictures proper, and in immediate connection, the people in an audience observing those pictures. A number of unsafe practices in yards and shops are vividly

Reproof for Not Wearing Goggles

enacted. One sees the result of leaving nails sticking up in loose planks and the loss of an eye because of refusal to wear goggles; a carpenter loses a finger while working at a buzz saw with the guard removed; a brakeman is knocked off the roof of a box car when a coupling is made, because he carelessly stood too near the end of the car; a brakeman who went between moving cars contrary to instructions falls and his arm is run over, in plain view of the audience; an engineman standing between the rails and boarding the footboard of an engine falls under the engine and is killed. As each of these scenes appears on the screen "close-up views" of the various characters in the audience are shown, and one can see clearly their facial expressions depicting the great impression the vivid scenes on the screen have made on their minds. For instance, a one-eyed man, viewing the scene in which the shopman injures his eye, turns to his wife and tells her that that was the way he lost his own; another man with a crippled hand tells his daughter, who sits beside him, that the man in the picture, who used the saw without the guard, paid the same price that he did for his carelessness, etc. Views also show the impression on Jack, himself, as the various scenes are flashed on the screen. It is evident that he is considerably impressed and that he has definitely seen the error of his ways. The closing scene shows this most strongly when Jack bends over the bed in which his children are sleeping and resolves to banish carelessness forever. The play ends with the lines: "Resolution became the cat that killed carelessness, the rat that was eating happiness, the malt that lay in the house that Jack built."

Possibilities of Steam Railroad Electrification*

Summary of the Chief Reasons Why Electricity Is Gradually Replacing Steam as a Motive Power

By William Arthur
New Haven, Conn.

The use of electricity as a means of motive power on our steam railroads is growing, and all the indications are that its use will extend even more rapidly in the future than in the past. As was to be expected, the new motive power was first applied to those situations where the limitations and disabilities of the steam locomotive were most apparent, namely: to subway services, elevated lines, congested city terminals, to high-speed local passenger service, to tunnel operation, to the operation of heavy mountain grades or where special conditions, such as high-priced fuel, bad water or competition from paralleling trolley lines, were important factors affecting the local situation. It is of interest to briefly review some of the more important advantages which follow from electrification.

Elimination of Smoke

Getting rid of smoke means greater comfort and cleanliness for all concerned. This in turn brings about increased traffic receipts, since the public is led to travel more frequently. It also means greater safety, since signals are often obscured by smoke, particularly in long tunnels. It was an accident from this cause which first led to the electrification of the New York Central's Park avenue tunnel leading to the Grand Central terminal at New York. A similar accident made necessary the electrification of certain of the Italian State Railways. Dense smoke which constantly delayed traffic brought about the electrification of the Hoosac tunnel of the Boston & Maine—other similar cases might be cited. It is obvious that the operation of modern subway and tunnel services in large cities would be impracticable with steam locomotives.

Freedom from smoke causes real estate values along the right-of-way to rise. It permits the operation of passenger terminals on more than one level, thus increasing the worth of valuable city property; terminal tracks may be built over by office buildings, and valuable aerial rights are thus acquired.

Reduction in the Fuel Bill

Electric trains require coal to be burnt just as steam trains do; the difference is that instead of using a large number of small scattered steam engines, whereon the fireboxes, boilers and cylinders—to say nothing of the men—are subject to all the inclemencies and uncertainties of the weather, these are combined in one large power station, where, being indoors and under carefully regulated conditions, the coal can be burnt to better advantage. Not only this, but a cheaper grade of coal can be used.

Under ordinary conditions, it has been found that one ton of coal burned in a power station will produce enough electricity to move a certain train a certain distance, whereas one ton of similar coal burnt in the firebox of a steam locomotive will only move the same train approximately one-half the distance. This means, then, that for the same amount of traffic the coal bill is reduced to about one-half when electricity is used. The records on lines which are electrified show that in certain services the saving is even greater. Since the cost of fuel is one of the largest items of expense on a railroad, these savings may represent large sums yearly.

Reduced Expenses for Engine Maintenance

It has been found that under average conditions the cost of electric engine maintenance is from one-half to one-third of the cost of similar steam engine maintenance. This is chiefly owing to the elimination of the firebox and boiler, but is also due to the simpler construction and freedom from reciprocating parts. Since locomotive maintenance costs form quite a large percentage of the total expenses of a railroad, it can be seen that a reduction in this item to one-half or one-third represents a very great gain.

Reduced Expenses for Enginemen

Two or more electric locomotives may be coupled together and operated by one engine crew. Practically no extra duties are required of the engineman whether he is operating one, two, three or more electric locomotives. He simply moves the controller handle backward or forward on any locomotive, and the motors on each locomotive are thereby automatically controlled. It therefore often becomes possible to increase the size of trains, using two or more electric locomotives, and operate the heavier train using only one engineman and one fireman. The expenses for enginemen are thereby reduced.

More powerful steam engines would, of course, produce this same result, but we are approaching a practical limit in the size of steam locomotives beyond which the increased cost of track and engine maintenance tends to prevent further enlargement. Not alone this, but track clearances of themselves introduce definite limits which cannot be exceeded. Large steam locomotives become difficult to operate and expensive to keep in order.

Where motor car trains are used, the operation becomes such a simple matter that no fireman is required, thus effecting in this case, as well as in the others, an important saving.

Increased Track and Terminal Capacity

In passenger terminals the track capacity is increased because with electric trains there is no need for coaling, watering, blowing out of boilers, cleaning out of ashes, switching, running to turntable, etc. A greater number of trains can therefore be handled over the same tracks in a given time.

In freight terminals the same is true; in addition it is found that due to the better control and quicker action of electric switchers in making up and assembling trains, etc., a large gain in track capacity and in tonnage handled in a given time is possible. There have been many instances where the adoption of electricity has removed to the distant future the need for expensive additional trackage. In some cases the cost of this would have been greater than the cost of electrifying the existing lines.

Greater Reliability

Those not familiar with the results which have already been obtained under electric operation may doubt that electric trains will operate more reliably than steam trains. The use of electricity is so new that it is quite hard to believe that this can be true. Yet that it is so, can easily be shown by comparing the delay records of any large representative electric railroad with the corresponding records under steam operation.

During one whole year (1912) the services on the Pennsylvania's electrified system were operated with a total delay to all trains of only 43 minutes from electrical causes. This total was due to 13 trains which during the year were detained an average of a little over three minutes each. During this time approximately one million train miles were run, or 75,000 miles per delay. The delays from mechanical and all

*Abstract of lecture delivered at New York University, November 15, 1915.

other causes in the same time totaled 23 minutes—a truly remarkable performance. Even this record has recently been surpassed on the New York, Westchester & Boston electrification—one of the allied lines forming part of the big New Haven electrified system—where 125,000 miles per failure have been recorded.

In the electrically operated freight yards of the New York, New Haven & Hartford the electric switching locomotives have operated 1,000,000 miles with a record of only one motor failure. On the New York Central electrified system during the year 1914 the electric locomotives operated with an average of 22,000 miles per delay, whereas the motor car trains operated with 51,000 miles per delay. Other examples might be given of records which it would be difficult to duplicate with steam services. The fact is, however, already well demonstrated; and even in so short a time electricity has proved that it is a more reliable transportation agent than steam.

There is one point, however, which tells against the reliability of electrical operation when compared with steam services. A failure of the supply of power—caused, say, by a breakdown at the central power station—is likely to be a much more serious matter than the breakdown of any single steam locomotive would be. Fortunately, this is something which very rarely happens; and on most important electrifications more than one power station is usually available from which to supply the trains—thus minimizing the chances of a complete loss of power with consequent tie-up of the entire electrified system.

In large cities, such as New York, Chicago, or London, where many separate electric railway systems are supplied from power stations owned and operated by separate companies, arrangements and inter-connections have been made so that in any emergency each power station acts as a partial reserve for the others. In other cases the chances of complete shutdown are minimized by the use of electric storage batteris which are kept constantly charged ready for emergencies. A notable example of this is to be seen on the electrified system of the New York Central at New York, where the storage batteries installed are large enough to carry the entire services for nearly an hour, even with all power stations shut down. Storage batteries, however, as a general thing, are not very much used nowadays; reliability being secured in some other manner, as outlined above. E. B. Katte, chief engineer of electric traction of the New York Central, recently stated that on the electrified portion of this system not one minute's delay had occurred to trains from power house troubles during eight years of operation.

Increased Power During Cold Weather

What happens on most steam railroads in case of as sudden snap of cold weather? The coaches require extra steam to maintain a proper temperature, or passengers will complain. At the same time the intense cold causes increased cylinder condensation, and under these conditions the locomotive cannot exert its full power. To make matters worse, the oil or grease in the axle bearings along the train becomes frozen, thus increasing the total train friction and the load on the locomotive. That is to say, cold weather increases the load on a steam engine at the time when its power or capacity is decreased. The result is that the locomotives cannot make steam fast enough. Trains run late and schedules have to be readjusted.

An electric locomotive (or any electric motor) is more powerful in cold than in hot weather. The reason for this becomes clear when one considers what it is which limits the power or capacity of electric motors. The power or capacity of an electric motor depends on its ability to get rid of the heat generated in it by the passage of the electric current. The colder the day, therefore, the quicker the locomotive motors will part with their heat, and the more powerful they will become. This increase in power takes place just at the right time; *i. e.*, at the time when, due to frozen bearings, the trains are harder to pull.

Increased Tractive Effort

We have all noticed that when slowly starting a heavy train, a steam locomotive will slip its drivers at regular intervals. This is due to the fact that the turning effort of the pistons on the cranks is irregular—is greater at one time than at another. At certain points in each revolution there may be an excess of power available—enough in fact to slip the wheels; at other points in the revolution the effective power is reduced and the wheel no longer slips. Because of this irregular turning effort, train tonnage is sacrificed.

With electric locomotives the turning effort of the motors is perfectly uniform, and a uniform turning effort is therefore transmitted to the wheels, enabling them to maintain their maximum tractive effort at every part of the revolution. The increase in hauling capacity thus gained is of the order of 20 per cent. This means that whereas steam locomotives under certain conditions of wheel and rail can exert a tractive effort equal to, say, 25 per cent of the total weight on the driving wheels, the corresponding figure with electric locomotives is nearly 30 per cent. The importance of this feature in practical railroading has not yet been fully appreciated.

Reduction in Manual Labor on Trains

With electric trains no hard manual labor is required of either the engineer or fireman. The former is unaffected either by the intense heat from a firebox, on the one hand, or the inclemency of the wind and weather on the other. He is free from smoke, dust and dirt; in fact, is in a better and entirely more comfortable situation.. Having simply to operate a small and easily moved controller handle he is in a better position to concentrate his attention on the signals, the brakes and the economical operation of the train. This feature makes for greater safety and economy.

The fireman gains by the change to an even greater extent; for the chief part of his duties—the shoveling of coal—is now being done for him miles away by means of large automatic stokers at the power station. On trains hauled by electric locomotives he is required to give minor attention to the various switches, small motors and other auxiliary electrical apparatus situated in the body of the locomotive. Since, however, the real inspection and maintenance of this apparatus is already taken care of in inspection sheds at regular intervals—usually every 1,000 to 2,000 miles—by electrical inspectors and repairmen specially trained for the purpose, it can be seen that the fireman's lot is greatly improved when compared with his former condition.

Recuperation of Energy on Grades

If properly arranged, an electric motor will retard a train just as easily and just as quickly as it will accelerate one, and in retarding will generate electricity. This idea has been applied to trains operating on long and heavy grades and there it has worked out most successfully.

On long mountain sections, both in Europe and in America, heavy trains are being operated on down-grade without the need for the application of air brakes, except to bring the train to a final stop; *i. e.*, the motors themselves hold the train under control and lower it down the grade at more or less constant speed, and then, when desired, the air brakes are used to stop the train in the usual way. This means the saving of brake shoes, tires, reduced wear and tear, etc. Not alone this, but, as stated, trains going down grade, by the very act of braking are returning electric energy to the overhead wire to assist in hauling other trains up the grades or on level track at other points on the system. Under these circumstances the air brakes are hardly used at all. It is not necessary to enlarge on the great value of this feature, not

alone from the viewpoint of possible economy, but from considerations of safety also.

Decrease in Fixed Wheelbase

On curves the use of a long, fixed wheelbase is destructive to both track work and wheel flanges. Shorter fixed wheelbases are more practicable with electric rolling stock than with steam locomotives of the same power, for the reason that the greater adaptability of the electric motor permits a better grouping of the various parts required for the mechanical transmission of power.

Reduced Weights Per Axle

In the effort to increase the size and power of steam locomotives, the weight carried per driving axle has been increased to as high as 65,000 lb., or even 70,000 lb. These heavy weights, together with the pounding action which takes place, due to the heavy reciprocating parts, increase the cost of track and bridge maintenance, and in some cases necessitate the replacement of the existing rails with new rails of heavier section because of safety considerations. With electric trains the need for these heavy weights per axle is largely done away with, and weights of from 40,000 lb. to 50,000 lb. per axle are rarely exceeded, thus greatly extending the life of track work, rails and bridges, and increasing the safety of operation.

Safety of Operation

The question of safety in operation, overshadowing as it does all other considerations, should by rights have been discussed before the subjects which so far have been dealt with. It is introduced at this late point, however, not because its prior claims to importance were not fully recognized, but because many of the reasons why the electrical operation of trains is safer than steam operation will have naturally revealed themselves in what has already been said.

One further point may be mentioned. With electric trains a device known as a "dead man's handle" may be and usually is fitted to the main controller handle. If, for any reason, such as paralysis, heart failure or other cause, an engineman becomes incapacitated and releases his hold of the controller, the electric current is at once automatically cut off and the brakes applied on the whole train.

Summing up the question of safety: The removal of smoke which heretofore may have obscured signals; the uniformity of the motor capacity during cold weather reducing, as it does, the need for attempts to make up for time lost due to low steam pressure; the freedom of the engineer and fireman from the distracting influences arising out of the hard manual operation of a steam locomotive, permitting as it does a closer concentration on the road and signals; the possibilities of electric braking with the air brakes at all times held in reserve; the effect of a reduction in the fixed wheelbase on curves; the lower weights per axle which are possible, together with the elimination of the pounding action on rails due to the unbalanced reciprocating masses at high speeds; and lastly, the use of the "dead man's handle"—all of these considerations make for greater safety. Taken together, they of themselves form one of the strongest possible arguments which could be advanced in favor of electrification.

On the other hand, it may be asked: "Does not the possibility of electric shock introduce new dangers?" Undoubtedly this is so, but under the usual arrangements it is practically impossible for a man to get an electric shock unless he wilfully violates the rules given for his guidance. On electric rolling stock all highly charged parts are carefully screened away to avoid any possibility of accidental contact; so much so, that during the past 12 or 15 years the writer cannot remember a single instance wherein a railroad employee has been able to get a severe shock without complete infraction both of the rules of the company and of common sense. During the same length of time, and prior to it, he has known of many cases where men have been severely burned on steam locomotives due to broken gage glasses or from other causes.

On electric rolling stock, as everywhere else, the use of ordinary common sense applied to the safety first idea has been found to be the golden rule of railroading. If a man follows this he will find himself to be on the whole safer on an electric than on a steam locomotive; and as already pointed out, the transportation of passengers and freight becomes incomparably safer due to the many reasons which already have been stated.

Other Features

In addition to the points already discussed, there are many other advantages of lesser importance which follow from electrification, such as the decreased fire risk due to the elimination of heated sparks, particularly in forest regions; the reduction in the expenses for painting structures and buildings, etc., due to the elimination of smoke; the higher schedules which are attainable particularly in heavy freight work, and so on.

What Retards Its Adoption?

With the many advantageous features above outlined which the use of electricity as a motive power offers, it is necessary that we now inquire what factors have tended to prevent its more immediate and general adoption on our railroads. There have been two chief factors. The first was the relatively large capital investment required, and the second the rapidity with which electrical apparatus has heretofore become out of date. Both features were to be expected in any art which is so young and which at the same time has developed so rapidly.

With regard to apparatus becoming out of date: To understand the conditions which have heretofore obtained regarding this, it is necessary that we first briefly mention the different systems available for electrification. Speaking generally, there are today three systems under which railroads may be electrified. They are known as the direct current system, the three-phase system, and the single-phase system.

Each system possesses certain advantages and disadvantages when compared with the others. Until recently, however, a railroad which adopted any one of the three was, as it were, permanently wedded to that system. Until now the situation has been somewhat similar to that which faced steam railroad engineers years ago when several different track gages were in use at the same time. The resulting confusion, inconvenience and expense was considerable. Gradually matters adjusted themselves until today narrow gage and freak gage railways have practically disappeared. In the same way, until recently, an electric train fitted with, say, three-phase motors, could not be simultaneously operated from the same overhead wire that supplied trains fitted with direct current or with single-phase motors. Recently, however, large strides have been made toward the development of what may be called a composite or mixed system, which combines in itself the chief advantages of each of the three present systems, and at the same time is largely free from the disadvantages of any of them. Today, although some future development is still necessary, we have already reached the point where all three types of motor can be simultaneously operated from the same overhead wire.

It will, therefore, be seen that in the future it is unlikely systems will become out of date so rapidly as heretofore. Not alone this, but adjacent railroads built under certain of the three present systems, if nceessary, and at relatively small expense and complication, will be able to make the adjustments necessary for operation interchangeably on roads equipped with either of the other two systems.

Along with this development toward a composite or standard system has come a corresponding simplification and development of the apparatus required for power houses, transmission lines, catenary and contact systems, etc. Power stations

can today be built for, say, two-thirds of their cost ten, or even five, years ago. Reductions have also taken place in the capital costs required for the other apparatus mentioned. This new electrification apparatus is not only cheaper but is more durable, efficient and economical both to run and maintain. It will, therefore, be seen that from the considerations of capital expense, obsolescence and efficiency the situation with regard to electrification has very much improved within the last few years. This is proved by the fact that whereas a few years ago, railroads were electrifying because of the pressure of public opinion, which demanded the elimination of the smoke nuisance (a demand entirely apart from the question as to whether that particular electrification was or was not economically justified)—today railroads are electrifying mainly from reasons of economy. Most of the recent electrifications in America are examples of this tendency.

The lower capital costs referred to; the pronounced development towards standardization; a clearer and more widely diffused realization of the economic possibilities; a growing public opinion, coupled with the need for the conservation of our natural resources, all of these are factors tending to produce an increase in the rate of electrification progress.

In conclusion, the writer does not wish to be regarded as one of those who believe the steam locomotive to be out of date; on the contrary, a fairly long acquaintance with it has only served to emphasize his appreciation of its many strong points. The adoption of superheaters, mechanical stokers, brick arches, air jets, feed water heaters, and other developments have all tended to improve its already high efficiency. Its capacity has been increased and its entire range of usefulness thereby extended. In spite of these things, however, it is difficult to escape the conclusion that the improvements referred to have but tended to postpone the day—far off though it may be—when the greater part of the world's transportation system will be operated by electricity. So far only the entering wedge has been driven. Less than 2 per cent. of the railroad mileage in either Europe or America is electrified, and these situations are those wherein, as previously pointed out, the disabilities and limitations of the steam locomotive have been most apparent. As time goes on it is fairly certain that the number of these will increase and the situations already electrified will form central points around which further electrification will gradually extend.

EUROPE STRUGGLING WITH A SHIP AND CAR SHORTAGE

By Walter S. Hiatt
Our Special European Correspondent

If the port of New York has 50,000 unemptied freight cars, if other ports in the United States have miles of freight in cars and thousands of tons on the docks waiting for ships to Europe, the reason must be looked for in Europe. The cause of this unmoved freight is not found altogether in English and Norwegian and Swedish speculation in tonnages, in a scarcity of tonnage due to the work of German submarines, or to the withdrawal of German ships from the world's waters. In the ports of Europe the docks are blocked with unmoved freight and ships are made to wait ten to twenty days to unload; in the ports of the Mediterranean army transports are held weeks overtime, on the side-tracks of France, Italy, Russia, hundreds of trains of cars are being held, sometimes empty, sometimes loaded, for a year; on the army fronts cars are used by soldiers as sleeping quarters. The effect of this waste of transportation facilities is felt throughout the world.

It is a too freely accepted axiom that war is waste. A soldier hasn't the slightest conception of preservation. All he knows how to do is destroy. He calls it military necessity. One day I saw a group of black Moroccan soldiers drag a piano out of a house and split it up for kindling. They did not do this because they were Moroccans, but because they were soldiers. The attitude of the soldier is shown in the way the English soldiers in the north of France jerk ties from under railroad tracks to use as fire wood. They split up box cars for the same reason, sleep in others, and then clamor for provisions from the rear, abuse the railroads for not forwarding their supplies more rapidly. As the war has gone on from month to month this spirit of waste has run its course in each of the many branches of the fighting organization until saner heads have come to the rescue, stopped the orgies, put order where there was disorder, overturned ministries if necessary, as has happened in each of the countries at war. Order was put in the methods of fighting, of hospital work, so that life might not be thrown away, then into the manufactories of clothes and munitions, into the furnishing of food supplies, all to the end that the wealth of Europe might not be entirely dissipated.

Now it is the turn to right the transportation problem both by land and sea, a problem which has found its echo in every corner of the world, in interrupted business, in high prices. Little Switzerland, for instance, without any interest in the war save to keep out of it, has been sorely affected by the transportation problem. Her coal and food have been shut off, and she has time and time again made serious representations to the French and Italian governments regarding her car shortage, at one time virtually accusing the Italian railroads of wilfully withholding 1,200 of her freight cars. France has already tackled her part of the problem. There the situation is typical of the other countries. The military way of solving such a problem is the ordering of new material to fill the bottomless pits dug by waste and carelessness. Legislatures may vote billion upon billion of money to be so expended, but transportation problems are not solved by the spending of money. France has just discovered that the solution of her problem does not lie altogether in the building of new ships and buying new railroad material, but in carefully using the means at her disposal. Her freight situation has been notoriously bad ever since the beginning of the war, as well it might be. The reason does not, however, lie in her unusual quantities of commercial freight, either domestic or foreign. While the United States imports have trebled, being about 2,000,000,000 francs ($400,000,000) this year as compared to about 750,000,000 francs ($150,000,000) in normal years, with her exports to the United States being nearly normal, her domestic freight traffic for commerce is but 60 per cent of normal and her total foreign tonnage delivered at ports is about 70 per cent of normal. Thus, according to her customs reports for the first nine months of 1915, 28,208 ships entered and cleared at her ports, as compared with 39,151 ships in 1913. In 1915 the tonnage total was 25,433,386 as compared with 44,722,295 in 1913.

The Waste of War; 2,000 Belgian Locomotives Idle in France for Fifteen Months

One of the big slices of her domestic freights was taken

away by the German invasion in the north. Each year the factories and mines and pig iron and steel plants in that region furnished many millions of tons of freight.

Apparently then, the French railroads, after the first great effort of mobilization, should have been in a position to clear the ports and to handle satisfactorily the freight situation.

Yet according to a recent official investigation made public by Le Journal, the Paris newspaper which has wielded a wide influence on war organization through Senator Charles Humbert's articles, the freight tie-up has, without counting slow munitions deliveries, cost the people of France some $200,000,000 in the form of a tax on food and coal, just so much money thrown away as France's share of the world tie-up.

To say that the railroads lack 50,000 cars, as is the case, does not explain the situation, nor has the blame been laid altogether at the door of railroad officials. Passenger service both for civilians and soldiers has been excellent at all times. There have been few accidents, thus indicating that the roadbeds are in good order, that the railway men have done their work well. However, from a railroad point of view, France is in the position of a man who goes broke and has to begin to wear his best clothes every day. At the beginning of the war the railroads had 400,000 freight cars, an ample supply for normal uses. Some few thousands of these were destroyed or left in German hands, particularly those belonging to the Northern and Eastern railways. Then some other thousands were diverted for English army uses in the north. A few more thousands were taken over for hospital trains and the special uses of the French army, such as the hauling of heavy cannon, others for the use of the engineering corps engaged in bridge building, in laying new track along the front. Add to these the number that broke down or were destroyed by army wear and tear and a total of 25,000 may be counted as having been permanently withdrawn from circulation. On the other hand, some 20,000 of Belgium's 90,000 cars were saved from the Germans, together with 2,000 of her 4,300 locomotives.

But the ports kept on choking up and the more they were choked the less chance there was of clearing them. Vessels arriving at Havre and Marseilles, and at Bordeaux, had to wait ten to twenty days to be unloaded because of the fact that the docks and warehouses were already filled with material. At one time there were counted 50 ships waiting in the harbor of Marseilles to be discharged. At Havre freight lay on the open docks as much as four months, damaged by hasty and careless unloading and weather exposure. As early as last January clothing and food given by charitable Americans for French and Belgian refugees lay for months at Havre and there seemed no way of getting it moved. Of course the railroads received the whole blame, particularly the state railway serving the ports of Havre, St. Nazaire, Rochelle and Bordeaux, where much of this over-sea material arrived.

The French official investigation began at the ports and showed that all the ports of France were paying an average of $80,000,000 a year in demurrage because ships were not promptly discharged. The port officers defended themselves by pointing to the lack of longshoremen, to inexperienced German prisoner labor, to their overflowing docks. They finally pointed to the lack of cars as the big reason for the tie-up.

This drew attention to the car shortage, a problem rather new to the French railways, at least in the American sense. The first result of the investigation was the ordering in the late fall by the state railways for spring delivery of 10,000 freight cars and 140 locomotives.

But with the price of food and coal soaring, with more cars and more ships needed to take care of the Balkan situation, the situation was becoming desperate. The investigation went on, became more intensive, until this December it brought out the deplorable waste of cars by the army. In vain had the railroad officers declared that they had no cars, that cars which went to the front seldom came back, that whenever the army demanded cars for the transport of troops or cannon they had been forced to take these cars out of the commercial service.

In one case, on the line of the state railway, at Cognac, a train of 42 cars loaded with barbed wire for trench use had stood 14 months waiting to be unloaded.

While the military hospital at Poitiers was unable to obtain coal at any price to heat its wards, a short distance away in the suburbs 121 cars stood on the tracks loaded with barbed wire. These cars had been there for one year. An ample supply of coal was in the port of Rochelle, not far away, but the coal dealers could not get cars to move their coal. The port authorities many months before had at Rochelle-La-Pallice bought all the modern equipment necessary for the quick unlading of ships, they had therefore been able to unlade the ships coming there, they had filled their docks and warehouses, but they had received an average of one car a day of 20 tons' capacity to carry away the freights. For this reason coal was selling at retail at Paris and other cities for $20 a ton.

While sugar was retailing at 11 cents a pound, 10,000 tons of sugar lay at Havre waiting for cars. Meanwhile 729 cars stood idle and empty for a year on their tracks at Bourget, near Paris. They belonged to the Compagnie Auxiliaire des Chemins de Fer, of Paris, which made a business of building and renting cars to the railroads.

An investigator cited three long trains designed to haul aeroplanes and to lodge aeronauts. Two of the trains, loaded down with 7 aeronauts instead of the 50 meant to be accommodated, went away into the mysterious region known as the front and the trains never came back. The third train of cars stood at Versailles solemnly guarded by bayoneted soldiers.

Likewise was noted the case of a company of 250 bridge builders located at Dieppe-Rouxmesnil sleeping in 35 cars, for each of which the war department paid 40 to 50 cents a day. In the same neighborhood 1,000 cars were needed to move the potato crop, with the consequence that potatoes tripled in price on the markets.

On the whole it was estimated that 60,000 cars were tied up uselessly by army departments, or else converted into shelter for soldiers and refugees, and all because officers and soldiers had not the slightest understanding of the value of a freight car.

In an official explanation the state railway, on the tracks of which stood many of these idle cars, laid the blame at the door of the war department, though pointing out that its system was making 10,000 daily car shipments against 12,000 in peace times. It also explained that it had arranged to buy 10,000 cars and 140 locomotives in England and the United States.

Just afterwards it was discovered that no less than 2,000 Belgian locomotives saved in the early days of the war had stood idle at various stations and side-tracks in France for a period of 15 months. An immense lot of them, about 1,000, were found at Mezidon, on the open tracks, exposed to the weather, rusting away. Fifty of them were at once put in service.

Although the car shortage was inevitable, its severity could have been modified by placing the railroads absolutely under a single dominating head, at once controlling the military and commercial uses of the railroads, and thereby able in particular to prevent the abuses and misuses of the minor army officers. To date, in theory only does the Fourth Bureau of the war department control the railroads. In practice, each railway operates as in peace times, with war needs looked after by a commission composed of officers from each railway. When the Fourth Bureau needs a train of cars, it merely communicates that fact and does not concern itself with car shortages. If a train of cars goes to the front, the railroads must wait the pleasure of some minor officer as to when that train can be returned.

As a result of the French investigation, it is promised that cars will move more rapidly, that the ports will be cleared, demurrages shortened; and there is hope that the $5 rate between France and England will be lowered to $1.50 to $2.00 and that of $17.50 rate between the United States and Europe will be brought down nearer the old $2.00 to $2.50 rate. The agitation in the United States to obtain ships, so that products now absolutely

shut out of the European market may be sold, has already been anticipated in a measure by France through the taking over of 60 ships representing 200,000 tons. As ships have been paying for themselves within two or three voyages, owing to the high freights, it is not likely that the French government will be a loser by the transaction. These ships will not be used for transport, but for commercial purposes, some of them being intended to run to the United States.

A DISASTROUS COLLISION WITH AN UNUSUAL CAUSE

A butting collision between a northbound passenger train and a southbound freight train on the Nashville, Chattanooga & St. Louis, which occurred on December 23, 1915, between Rockledge, Tenn., and Sherwood, in block-signaled territory, was caused by the freight train receiving an improper clear signal at Rockledge after the passenger train had been admitted to the block at

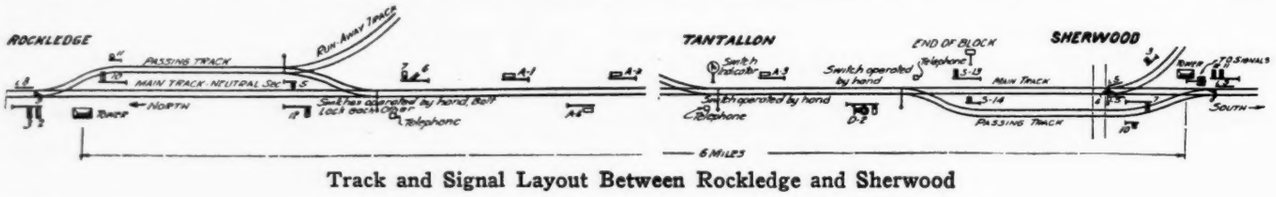
The Cut in which the Collision Occurred

Sherwood through the proper operation of the system. A false clear signal is such a dangerous thing, and in all properly designed signal systems, such an unusual thing, that its occurrence demands the fullest investigation to determine the causes. In this case while the investigations have not determined absolutely the cause of the failure, a number of very interesting possibilities have been brought to light and on account of the existence of of mountain operation, a semi-automatic controlled-manual signal system was installed in April, 1911. This governs two blocks, one three miles long between Rockledge and Cowan, on the north, and one, six miles long, between Rockledge and Sherwood on the south. The entrance to these blocks is controlled by semi-automatic signals, cleared from towers after the proper clearance has been received from the opposite end of the block by means of telephone communication and electrical block instruments. An interlocking plant at Rockledge controls one end

One of the Guy Wires that Produced Heavy Ground. Guy Anchor Directly Under Man at Right; Slope Stake for New Embankment Under Foot of Man at Left

of a long passing track with the necessary signals. At the other (lower) end there is a runaway track in place of the ordinary derail, and the hand-operated switches governing the entrance to this runaway track and to the main line bolt-lock each other.

Absolute block is maintained on the section between Cowan and Rockledge (north of the summit), but from Rockledge south to Sherwood pusher engines are allowed to follow trains down grade under a permissive signal, the securing of which requires the co-operation of the engineman and the signalmen at both ends of the block. Northbound this block is operated as permissive, for freight trains, under the direction of the despatcher. This six-mile block is divided, approximately in the middle by an intermediate automatic signal for southbound trains, and by two intermediate automatic signals for northbound movements. These signals operate in two positions, proceed and caution, and were installed with no idea of head pro-



Track and Signal Layout Between Rockledge and Sherwood

similar conditions on some other roads, the experience gained here will doubtless be of value to other railway officers.

Rockledge is at the summit of Cumberland mountain, 60 miles west of Chattanooga, on the Chattanooga division of the main line which, at this point, is single-track. On either side of the summit the grade of the line is two per cent, and in order to facilitate and safeguard the traffic under these natural hazards tection but simply to indicate to following trains the approximate location of trains ahead, moving in the same direction. No train orders are issued for movements in this controlled-manual territory.

On the day of the collision, regular passenger train No. 2, northbound, which is due at Sherwood at 3:32 p. m., was late and a special train to pick up company laborers along the line to

take them to their homes for the Christmas holidays was run as the first section of No. 2. This train was held at Sherwood to meet No. 95, a southbound passenger, which was also running late. As soon as No. 95 passed, the operator at Sherwood called the operator at Rockledge for a clearance for a northbound movement, and received it. He therefore cleared the signal for first No. 2, which passed into the block at 3:47 p. m. A little later he received a call from Rockledge asking him to try to catch No. 2, but this proved impossible as it had already passed the only intermediate telephone in the section.

In the meantime, freight train No. 55, southbound, with two helper engines, one pushing and one pulling, had reached Rockledge. This train found the route lined up for the passing track, it being the intention of the towerman to hold it to meet No. 2. In order to cut off the leading helper, the train was stopped short of the switch to the runaway track, and the front engine was uncoupled and run on to this track. The fireman and the helper on the leading engine, who were co-operating to throw the inter-connected switches at the runaway track and the main line, noticed the dwarf signal No. 5, used to control movements from the passing track to the main line, go to the clear position. The men were uncertain whether the signal was entirely clear and one of them called to the signal maintainer who was working on the pole line near by. He replied that the signal was clear, and they called to the engineer of the helper engine to whistle a clear signal. The engineer on No. 55 (who, although only a short distance away, was around a curve and could not see the dwarf signal) on hearing this whistle signal, pulled out. The operator in the Rockledge tower could see the train moving, but as the rear end, when first stopped, had hung out on the main line, he assumed that they were simply pulling down to clear the main track, a practice which was not uncommon. He was busy entering the arrival of No. 55 on his train sheet and the first intimation he received that the train had pulled out on the main line was the tapping of the indicator bell in the tower, which is controlled by a track circuit below the south end of the passing track. Knowing that the block was occupied, he tried to signal to the men in the caboose of the receding train, but as both the conductor and the flagman were on the front part of the train at the time, this proved impossible.

No. 55 proceeded into the block with this false clear signal shortly after No. 2 had entered at the opposite end, and the two trains met on a 6-deg. curve in a rock cut about 30 ft. deep with vertical walls. The engineman and the fireman of the passenger train were killed, 9 of the passengers (employees off duty) were killed and another, who was injured, died later. Three passengers, not employees, were injured and 28 passengers (employees off duty) and 4 employees on duty were injured.

From the facts brought out in the inquiry following the accident it appears that the signal maintainer discovered the improper action of the signal by noticing that it was at clear after No. 55 had passed it, and gone down on the main line. He went immediately to the signal case and shunted the relay, upon which the signal went to stop, but upon removing the shunt it cleared up again, part way, and then returned to stop. The testimony brought out the fact that during the five years in which this system has been in operation there has never been a clear failure; and this fact, in connection with tests made after the disaster, which apparently demonstrate that it is impossible to energize signal 5 with its lever normal, by any combination of signal wires at this point, indicates very strongly that the energy came from an outside source.

There is no electric railway or other source of electrical power within many miles of Rockledge, and apparently the only possible source of such foreign current is in the Western Union telegraph wires, which occupy the same pole line as the signal control circuits. The possibility that an accidental cross of this kind occurred is increased by the fact that at the time of the accident, Western Union linemen were engaged in moving back the pole line a distance of about 30 ft. in order to provide space for an additional track. The signal maintainer had been cutting in slack on the signal wires at the second pole north of the dwarf signal No. 5, and at the time of the accident had not yet taped the joints made for this purpose. He testified that while standing at the signal immediately after its failure he noticed the Western Union linemen pulling up one of the loose ends.

It developed further at the investigation that a fire had been built under the pole line near this point for the burning of old ties, and that this had seriously charred the insulation on the copper-clad line wires of the signal system. The wire was not exposed, but without doubt, the insulating properties of the protective material were materially reduced. It was also found that in moving the pole line near Tantallon, four miles south of Rockledge, the poles had been moved, but the guy anchors had been allowed to remain in their original location, a considerable distance within the limits of the new fill for the additional track, and that the guy wires had been lengthened to connect these anchors with the poles. In two cases the dumping of rock for the new fill had depressed these guy wires to such an extent that they had been pulled down over the common wire of the signal system and had cut entirely through the insulation. The signal maintainer testified that the condition of these guy wires had not been discovered previously, as it did not affect the normal operation of the system; and from other testimony it is probable that the condition had not existed many days.

In order to determine the voltage carried by the Western Union wires, voltmeter readings were taken between each of the 14 wires on the pole in question, and the relay control wire. These readings were subject to considerable fluctuation, but the best averages that could be secured showed 215 volts on two of the lines, 122 volts on one, 120 on three, and the others ranging all the way down to 2 volts. The three wires carrying 120 volts were crossed one at a time and the voltage measured at the relay, giving results varying from 22 volts to 35 volts. As the relay controlling this signal requires for its energization only 5.6 mil-amperes at 5.6 volts, it is evident that in connection with the ground of high potential which was shown to exist on the common wire, a cross between any one of 12 of the 14 Western Union wires and the relay control wire could have caused the improper display of a clear signal.

Efforts to establish the exact cause of this signal failure are complicated by the relations which have existed for a number of years between the railway company and the Western Union Telegraph Company. A contract was entered into between these companies on April 8, 1867, providing for the maintainance and operation of a telegraph line on the railway's right of way, this contract being extended at intervals, subject to termination by either party on six months' notice. This was later superseded by another contract providing for one year's notice, and this was in force until August 17, 1912, being terminated then by the telegraph company through a written notice served one year previous. Immediately following the termination of this contract the Western Union asked the railway company for a right of way over its property, offering a remuneration of five dollars a mile. Failing to receive an acceptance of this proposition, the telegraph company filed condemnation proceedings in all counties in the state of Tennessee. As a number of points in law were involved, which had never been ruled upon, a test case was tried in Carroll county, which has since been carried through the courts to the supreme court of Tennessee. A decision from this court is expected in the near future. During this litigation, the telegraph company has been operating its lines under an injunction restraining the railway from molesting its pole line or wires in any way. As a result of the dissatisfaction growing out of these relations, the railroad company has built a telephone line from Nashville to Chattanooga for the despatching of trains.

THE NEW STATION AT LEIPZIG.—The Berne correspondent of the Railway Gazette, London, reports that despite the war, the Leipzig main railway station, planned originally 30 years ago, has just been completed. It was not begun until 1901, and the cost, in round numbers, has amounted to $24,000,000.

THE COMMISSION TO STUDY THE RAILROAD SITUATION

By W. L. Stoddard

Washington, Jan. 19, 1916.

At almost any time the Senate may take up the resolution, now formally before it, providing for the creation of a commission composed of senators and representatives who shall make a study of railroad laws and the need for change in railroad laws. With the general purpose of this commission, the readers of this paper are already familiar.

There is little probability that this commission will not become a fact before many months. The ways, it may be said, have been well greased for its launching. The President led off in his message on December 7, preceded by a statement a day or two previously from Senator Oscar W. Underwood, and the prompt introduction and reporting of the bill followed.

In circles which can be described neither as railroad circles nor as anti-railroad circles in Washington, one hears the opinion advanced that the Senate might do well to alter the composition of the proposed commission. The original scheme was for a commission made up of members of the two houses of Congress. Now it is suggested that the model of the Federal Immigration Commission be followed, and a total of nine men be appointed, one group of three to represent the Senate, another the House, and the third the public. One man in the third group, it is urged, should represent the railroads, another the shippers, and the other the employees.

It is betraying no confidence to know that this proposal, which has as yet barely begun to be spoken of in or around Congress, comes from a man long in the government service in a highly responsible capacity, and that the discussion of it which has come to the notice of your correspondent has been chiefly among men of this type—trained government investigators in the legal and economic fields.

Washington has seen a great deal of commissions of various kinds, and when it is suggested that Congress create a new commission for the study of this or that problem, the characteristic Washington reaction is not one of enthusiasm. Too often the commissions in the past have been merely perfunctory bodies, inexpert, extravagant, relying principally on the guidance of one or two employees to bring them through their brief life with anything like credit. The trouble with a commission composed exclusively of members of Congress is that it is too much like a mere committee of congress. If it be one of the objects of the proposed railroad commission to stimulate public interest in the peculiar problems now pressing the carriers, then it goes almost without saying that extra-congressional representation would be a legitimate bait wherewith to attract outside attention.

It is further pointed out here by those who are fathering this idea that the commission will have necessarily to deal with some fairly technical problems, and that in the very nature of the case it can not be expected that half a dozen or so members of Congress, no matter how intelligent or expert individually in general public policy, can not bring to an investigation of the transportation problem that intimate acquaintance which a trained railroad man, employee or operating officer, or which a shipper of long experience could contribute to the study.

While the immigration question did not present the intricacies offered by the railroad question, nevertheless the make-up of the Immigration Commission (1907-1910) was such that it is generally looked upon here as one of the most useful and least purely ornamental of the recent commissions of inquiry This commission was composed of congressmen and the public, judiciously divided. In its actual operation it undoubtedly owed much to just this fact of makeup. It is at least certain that the members became real students, for when the commission began its work, it was about evenly split on the question of restriction, and when the investigation was completed, it was unanimous for restriction.

How far the suggestion thus outlined will go when it reaches Congress is still to be determined. It is here given for what it is worth in the course of the current discussion on a very important pending piece of legislation.

TRAIN ACCIDENTS IN DECEMBER[1]

The following is a list of the most notable train accidents that occurred on railways of the United States in the month of December, 1915:

The trains in collision on the Texas & Pacific, at Texarkana, Tex., on the 4th were a through freight and a switching engine. The freight train ran over a misplaced switch and into the head of the switching engine, damaging both engines and two cars. One brakeman was killed and three other trainmen were injured.

The trains in collision near Lenzburg, Ill., on the 5th were northbound passenger No. 224 and southbound passenger No. 205. Both engines were considerably damaged; one fireman was killed and both enginemen and 18 passengers were slightly injured. The northbound train had finished station work and was standing on the side track; and the southbound ran over a misplaced switch and into the head of No. 224. The switch had been set straight after the northbound train backed in, but later was thrown, by a trainman, by mistake, as No. 224 approached.

The trains in collision near Dacula, Ga., on the evening of the 6th were southbound passenger No. 29 and northbound freight No. 82. Both engines, one mail car and two freight cars were badly damaged. One fireman was killed and two other trainmen and 13 passengers were injured. The cause of the collision was neglect on the part of the men in charge of the freight train, who overlooked an order.

The trains in collision near Middletown, N. Y., on the 9th were an eastbound freight and a work-train preceding it. The freight ran into the work-train and wrecked ten cars; and a part of the wreck fell on the westbound track and was run into by a westbound freight. Five trainmen were injured. The freight had run past a block signal set against it. The flagman of the work-train is also blamed.

The trains in collision at Stockton, Cal., on the 12th were

COLLISIONS

Date	Road	Place	Kind of Accident	Kind of Train	Killed	Injured
4.	Texas & Pacific	Texarkana	bc	F. & F.	1	3
5.	Ill. Cent.	Lenzburg	bc	P. & P.	1	20
6.	Seaboard A. L.	Dacula	bc	P. & F.	1	15
9.	Erie	Middletown	rc	F. & F.	0	5
12.	A. T. & Santa Fe	Stockton	bc	F. & F.	2	12
†17.	Balt. & Ohio	Felton, Pa.	rc	P. & P.	5	11
22.	Tionesta Valley	Sheffield J.	bc	P. & F.	1	0
23.	Nash. C. & St. L.	Rockledge	bc	P. & F.	12	35
†23.	Del. Lack. & W.	Slateford	rc	P. & P.	2	3
24.	St. Louis & S. F.	St. Louis, Mo.	bc	P. & P.	0	14
24.	St. Louis & S. F.	Galena, Kans.	rc	P. & P.	1	28
24.	Illinois Cent.	Wilson, Ky.	bc	P. & P.	0	18
24.	Toledo, St. L. & W.	Veedersburg	bc	P. & F.	4	19
25.	Norfolk & W.	Blackstone	bc	F. & F.	1	4
27.	Pennsylvania	St. Paris	bc	P. & P.	2	13
†28.	Texas & P.	Sweetwater	rc	F. & F.	1	8
28.	Gulf C. & S. F.	Mullen	bc	F. & F.	3	2
31.	Southern	Shipman	bc	P. & F.	1	10

DERAILMENTS

Date	Road	Place	Cause of Derailment	Kind of train	Killed	Injured
8.	Norfolk & W.	Arthur	boiler	F.	2	2
*13.	Nash. C. & St. L.	Kingston Spgs.	unx.	F.	0	0
22.	Central Ga.	Batesville	acc. obst.	P.	0	5
25.	Erie	Mountainville	d. track	P.	0	5

OTHER ACCIDENTS

Date	Road	Place	Cause of accident	Kind of train	Killed	Injured
2.	Chicago, M. & St. P.	Marion, Ia.	Fire	P.	0	2
4.	Great Nor.	Wenatchee	Slide	P.	1	0

[1]Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

eastbound and westbound freights. Both engines were wrecked and one engineman and one fireman were killed, and 8 passengers, two trainmen and two other persons were injured. The two persons killed were father and son; the father, engineman, on one train, and the son, engineer, on the other.

The trains in collision at Felton, Pa., on the 17th were an eastbound local passenger train of three cars and a following train consisting of empty express cars. The passenger train was standing at the station and the other ran into its rear end, crushing all three cars. Three passengers and two trainmen were killed and 11 passengers were injured. A part of the wreck fell on the westbound track and was struck by a westbound express train, but not much damage was done in this way. The collision was due to disregard of an automatic block signal a short distance in the rear of the standing train. The engineman of the empty-car train maintains that the distant signal had indicated clear.

The trains which met in collision near Sheffield Junction, Pa., on the 22nd were passenger No. 1 and freight No. 10 and both engines were badly damaged. The engineman of No. 10, (father of the engineman on No. 1), was killed. The cause of the collision was disregard of orders on the part of the passenger train.

The trains in collision on the Nashville, Chattanooga & St. Louis near Rockledge, Tenn., on the 23rd were a northbound passenger and a southbound freight. Both engines and many cars were wrecked. Twelve persons were killed and 35 injured, all of the killed being employees of the road, ten of them being laborers off duty. This collision occurred on a line operated by the controlled manual block system and is the subject of an article, explaining the cause, on another page of this issue. A power-operated signal gave a false clear indication to the freight train because of the energizing of a magnet by a foreign current, made possible by accidental crossing of line-wires.

The trains in collision on the Delaware, Lackawanna & Western, at Slateford, Pa., on the night of the 23d, about 11 o'clock, were the second and third sections of westbound passenger No. 9, the third section running into the rear of the second; engine and four cars badly damaged. One passenger and one sleeping car porter were killed, and three passengers were injured. The cause of the collision was made the subject of a circular by E. M. Rine, general superintendent of the road, which was sent to all employees in the operating department. The leading train, section 2, had been stopped by the flagman of section 1, because of delay to a freight train. Section 2 had then moved forward to a point about 500 ft. west of signal 727. While standing here it was run into. When the stop had been made to take up the flagman of section 1, the flagman of section 2 got down and placed torpedoes and a fusee. When section 2 finally stopped, its flagman started back immediately and reached a point 852 ft. east of signal 727, which was near the point where he had previously placed the torpedoes and fusee. The engineman of the third section failed to observe the semaphore signal in the rear of signal 727, which was in the caution position, claiming that smoke and steam from locomotives on an eastward freight train obscured his view of the signal, and also of the burning fusee; also of the flagman's light, which he did not observe until within about 400 ft. of them. On seeing the flagman, he made a service application of the brakes; then he saw signal 727 in the stop position, and tried to make an emergency application, but did not obtain full effect. His engine crushed about one-third of the rear sleeping car of the standing train. From the point at which he first could have seen the fusee he had a distance of 1,780 ft. in which to stop before striking the rear end of the second section. There were other landmarks, so that there could have been no excuse for not picking up the signal locations.

The superintendent apportions the responsibility among five employees. The engineman of the second section knew that there would be some delay and should have given the whistle signal for the flagman to go back; if he had done this, the flagman would have gone far enough to stop the third section, even if its engineman did not observe the distant signal indication. The conductor of the second section, knowing that there was a curve in the line immediately in the rear of his train, should have moved it forward when the flagman was called in. Both the conductor and the engineman of the second section are held equally responsible for failure to send the flagman back more promptly; also for failure to move the train ahead, as just mentioned, after the flagman was called in; for there was from one and one-half minutes to two minutes after he was called in before the collision occurred. This flagman (second section) should have dropped off green fusees as soon as his train had slackened speed when the engineman encountered an adverse distant signal farther back. If he had done this, there would have been a fusee warning about 4,000 ft. from the point of collision.

As to the engineman of the third section, the superintendent does not say that he is untruthful, but does say that the flagman had no difficulty in seeing the approaching engine and therefore there could be no reason why the engineman could not as easily see the fusee and the flagman's hand light. If the engineman failed to see the distant signal, he should, of course, have brought his train at once under control. This signal is on a bridge spanning four tracks and is the only signal on the bridge. The track is straight for a mile approaching this bridge; the night was clear, and there were no atmospheric conditions to prevent seeing the signal. All of the employees referred to were thoroughly familiar with the rules and had had many years of experience in the service. They all knew that train No. 9 was running in three sections.

The trains in collision near St. Louis, Mo., on the 24th were westbound passenger No. 823 and eastbound local passenger No. 86. Both engines were damaged. One fireman and 14 passengers were injured. The cause of the collision was a mistake of a leverman in the interlocking tower at Grand avenue. An order had been given to run two westbound trains on the eastbound track to Grand avenue; but he allowed an eastbound train to proceed after only one had gone west.

The trains in collision on the St. Louis & San Francisco, at Galena, Kan., on the 24th were passenger No. 387 of the St. Louis & San Francisco and a following passenger train of the Missouri, Oklahoma & Gulf (No. 1317). The Frisco train was standing at the station and was run into by the other. The fireman of the colliding engine was killed and 28 passengers were injured. The second train was following the leading train too closely, and at excessive speed.

The trains in collision at Wilson, Ky., on the 24th, were southbound passenger No. 335 and northbound passenger No. 402. The southbound train was standing at the station when the northbound approached. Three employees and 15 passengers were slightly injured. The cause of the collision was due to the excessive speed of the northbound train, the engineman misjudging the distance.

The trains in collision on the Toledo, St. Louis & Western, near Veedersburg, Ind., on the 24th, were eastbound passenger No. 4 and an extra westbound freight. Four trainmen were killed and six trainmen and 13 passengers were injured. None of the injuries are reported as serious. This collision occurred in a blinding snowstorm, and was due to a mistake in sending or receiving a train order transmitted by telegraph and by a coincident mistake in block working.

The freight trains in butting collision at Blackstone, Va., on the 25th, were extras, moving on a middle track. The eastbound took the middle siding to let two passenger trains pass, and the westbound to let a time freight pass. The fireman of the eastbound train was killed, and four other trainmen were injured. The collision was due to disregard of the rule to run under control while on this track.

The trains involved in the butting collision near St. Paris, Ohio, on the 27th, about 6 p. m., were westbound passenger No. 35 and eastbound passenger No. 34. Both engines and two cars were damaged and an express car was wrecked The engineman of the westbound train and the fireman on the eastbound

were killed and three trainmen and 10 passengers were injured. This collision occurred on a three-track line and was occasioned by a mistake in setting switches. Owing to an eastbound freight train being in trouble with some broken couplings on the eastward main track between "MY" tower and "BA" tower, it was necessary to move eastbound passenger train No. 34 between those points on one of the other tracks; and as westbound train No. 35 was using the westbound passenger track it was arranged to run No. 34 from "MY" to "BA" on the westward freight track; and orders were issued accordingly on Form 31; but the signalman in setting up the route for train 34, set it in error for the westbound passenger track; and the men in charge of train 34 did not discover the mistake. The collision occurred about 1,300 ft. east of "MY" tower.

The trains in collision at Sweetwater, Tex., on the 28th, were westbound passenger No. 5 and a preceding westbound freight which was standing at the station. The engine of the passenger train and the caboose of the freight were wrecked and a fire, which started in the overturned stove in the caboose, destroyed three freight cars. Eight passengers and the fireman were injured.

The trains which met in collision near Mullen, Tex., on the 28th, were extra freight trains. Both were running at full speed. One engineman, one fireman, and one brakeman were killed and two other trainmen were injured. Both of the engines and 15 cars were ditched in a cut. It is said that an operator had neglected to deliver a despatcher's order to one of the trains.

The trains in collision, at Shipman, Va., on the night of the 31st, were a southbound passenger and a northbound freight. The engine of the passenger train was overturned and three cars were badly damaged. Four passengers and six trainmen were injured and an express messenger was killed.

The train which was derailed at Arthur, Va., on the night of the 8th, was a westbound freight and the cause of the accident was the explosion of the boiler of the locomotive. Engineman and fireman killed and two other trainmen injured.

The train derailed near Kingston Springs, Tenn., on the 13th, was a southbound freight. The cause of the derailment has not as yet been definitely determined. The trailer trucks of the Mikado locomotive were derailed a short distance before entering on a bridge. The track on the first span was not badly damaged. The second span was knocked down, six cars going in on top of it and burning, two cars of gasolene, two crude oil. The engine and one car of cotton-seed meal passed out to the bank and remained erect. The pony trucks of the engine were on the rail as were the front trucks of the tender. The gasolene did not explode. In all, there were 13 cars burned. Trains were detoured three days.

The train derailed near Batesville, Ala., on the 22nd, was eastbound passenger No. 6. The tender was the first vehicle to leave the track. Five passengers were slightly injured. The derailment is believed to have been caused by some obstruction.

The train derailed on the 25th, at Mountainville, N. Y., was northbound passenger No. 350 consisting of a locomotive and three cars. A broken rail penetrated the floor of one of the cars. Five passengers were slightly injured. The cause of the derailment was a soft roadbed. A side hill embankment had become saturated with water.

The accident at Marion, Iowa, on the 2d, was caused by a fire in an express car due to some cause not satisfactorily ascertained. It is believed to have been due to the presence of motion picture films in merchandise in the car. The car had no end doors, and the express messenger and his helper had a very narrow escape from death. They clung to the iron ladder at the side of the door where they rode for several miles at high speed before the conductor discovered the fire and stopped the train. The two men were burned severely by flames coming from the open door. They were unable to reach the conductor's valve in the car, to apply the brakes, on account of the fire; and even if there had been no fire, they would have had difficulty in reaching the valve because of the great mass of freight piled up to the top of the car. The loss by the fire was $50,000.

The cause of the accident on the Great Northern, near Wenatchee, Wash., on the 4th of December was a landslide. A large boulder fell from the mountain side and crashed through the roof of the express car of train No. 44, and the express messenger was killed.

Electric Car Accidents.—Of the half dozen serious electric car accidents reported in the newspapers as occurring in the United States in the month of December, two were attended with fatal results. In Spokane, Wash., on the 18th, a street car fell through a bridge, resulting in the fatal injury of seven persons and the less serious injury of ten others. The bridge is owned by the city and repairs had recently been made to the floor system. In Richmond, Va., a locomotive ran into a street car, resulting in a number of injuries, of which one was fatal.

THE BOOK OF RULES; SOME PERTINENT QUESTIONS

By J. L. Coss

Considering the importance that properly is attached to a thorough understanding of the book of rules by all employees in the operating department, it must be conceded that more attention ought to be given to that particular subject. The misunderstanding or violation of a part of the rule may result in a serious collision or derailment, causing loss of lives and property.

If a trainmaster should locate himself at some convenient point, say 30 miles out of a terminal, and for twelve hours stop the crew of every train, would he find a half dozen rule books among that number of men? I doubt it.

How many stations could he walk into and find a book of rules?

How many trainmasters carry a copy of the book with them at all times?

It is the practice on some large lines to hold what they call "class meetings" about once a month and compel all trainmen and station men who are not at work to attend. This is a good thing. But what percentage of the employees attend these meetings? And how many do not attend at all? Are the meetings held often enough, and are effective measures taken to insure every man's attendance once in three months?

Another question; has the division staff the time to devote to the schooling, in a proper manner, of all the men? Why would it not be a good plan to employ a man from a foreign road, who is well up on rules, to go over the line and hold classes to give instructions at each terminal? In this way it would be a simple problem to secure the attendance of every man. Would this not have a better effect on most of the men than to be coached by one of their own officers? Undoubtedly it would.

Some time ago a railroad officer was heard to remark, after having been present at one of the "class meetings" on a large system, that he was utterly shocked at the ignorance of the rules displayed by the trainmen and enginemen in attendance. On a certain important line a conductor said he had not been in a "rule meeting" for two years. How can we expect to maintain "safety first," on which so much money is being spent, while such conditions exist among the men who are put in charge of the railroad property and the lives of passengers and employees?

An operator or a despatcher should thoroughly understand Rule 99. Is not this just as important as it is that an engineer know the difference between a "19" and "31" order? Train orders are issued from despatchers' offices which are not clearly understood by the men who are to execute them. Is this safe?

It would be money well spent to employ as instructor a man who has given the rules technical study and who can explain them to anyone; let him do nothing but go over the line and hold instruction meetings.

Maintenance of Way Section

Selection of Cross Tie Timber

In a paper entitled Woods Suitable for Cross Ties, presented before the Wood Preservers Association this week and abstracted elsewhere in this issue, R. Van Metre calls attention to the fact that the merits of a number of woods as tie timber are not sufficiently realized by many roads, and that as a result they are not securing the most economical tie in all cases. Certain woods are acknowledged to be more desirable than others for tie timber. From force of habit many roads continue to specify these woods in the face of their increasing scarcity and their rising cost, without ascertaining whether less durable, but also less expensive woods may not be used with greater ultimate economy. Each wood has its individual characteristics of strength, resistance to decay, etc., and it requires careful study of these characteristics to determine which timbers may properly be used for ties under the widely different conditions of service. By increasing the selection of suitable woods, by handling them to secure the best results, and by placing them in the track where they will give the longest service the better timbers will be conserved for use under conditions where the secondary timbers cannot properly replace them.

The Treatment of Douglas Fir

The treatment of Douglas fir timber has long been a problem in the timber treating industry and efforts to solve it have resulted in many disappointments. For this reason the favorable results submitted by O. B. M. Goss before the Wood Preservers' Association were received with no little interest. From this it appears that the process of boiling under a vacuum effects the desired penetration without the necessity of resorting to the high temperatures required with other processes, as applied to this timber, and which have had such a detrimental effect on its strength. It is to be hoped that the application of this experimental method upon a commercial basis will be successful, because of the influence it ought to have upon the conservation of the supply of one of our best structural timbers, and one which is available in sizes not to be had in many other woods. Owing to the difficulties experienced with treatment in the past and the fact that this timber is still available in large quantities in the Northwest, the matter of its treatment has not received the same serious consideration that has been accorded other species of wood.

The Handling of Construction Equipment

One of the problems which will confront maintenance of way officers in a short time is the handling of work equipment. The amount of this equipment on a road depends largely on the policy of the company concerning the handling of improvement work by company forces or by contract. On some roads all work along operated lines such as the construction of additional main, side or yard tracks and the reduction of grades is done with company forces and equipment. Other roads confine their constructive activities to the loading of ballast, ditching and similar strictly maintenance work. Even with this practice a considerable quantity of construction equipment in the form of steam shovels, ditchers, cars, etc., is required. The economical operation of this equipment depends on its proper distribution over the system that the maximum amount of work may be done in a season, and also upon the local organization to secure the greatest results at each individual location. From the system standpoint, it is necessary that some person direct the movement of the various items of equipment, arrange for their repair, and see that they are properly manned. Locally, and of even greater importance, is the attention to details to see that only that equipment is operated which is required, and that the necessary facilities and forces are at hand to enable all the connected operations to proceed continuously. One of the most common problems is the operation of a ballast pit. The engineer or roadmaster in charge can either waste or save for his company a large amount of money, depending on the degree of thoroughness with which he anticipates every requirement, and prevents delays not only to the force operating the steam shovel itself but to the work trains, and even to the track forces waiting for ballast out on the line. The handling of much work of this nature by railway forces will compare favorably with the methods of the best contractors. To make these methods available for all railroad men we announce a contest on The Handling of Work Equipment, to include discussions of methods for maintaining and operating all kinds of work equipment commonly employed in maintenance of way work by the railways in this country. The selection and distribution of equipment to the different locations, the organization of the forces at these different points, including the necessary track and car repair forces, the manner of operating the work equipment, including the trains, the nature and arrangement of the coal, water and other auxiliary facilities and the manner of making repairs to cars and other equipment all come within the limits of this contest. We will pay $25 for the best and $15 for the second best papers received, and our space rates for all other contributions accepted and published. All contributions should be sent to the engineering editor of the *Railway Age Gazette,* 608 So. Dearborn St., Chicago, and must be received by March 10 to be considered by the judges of the contest.

Increased Weight of Rail

Until about two years ago rail weighing 100 lb. per yard was the heaviest in general use in this country, except for the 135-lb. rail which the Central Railroad of New Jersey uses only on curves of heavy wear. Railway engineers have been reluctant to adopt heavier sections because of the difficulty in securing as high a grade of steel in the heavier sections as in the lighter rails rolled a number of years ago. The increased attention given to all phases of the rail problem, however, has created a belief in the minds of many that heavier rails are required to carry the increasing wheel loads. A year ago the rail committee of the American Railway Engineering Association submitted sections for 100, 110, 120, 130 and 140 lb. rails, although it did not recommend for adoption the last two sections as it did not consider them necessary at the present time. The Pennsylvania Railroad adopted a standard 125-lb. rail section a year ago and has placed a large tonnage of this rail in track during the past season. The latest advance in this line has been the adoption of a 136-lb. section recently by the Lehigh Valley, which road has ordered 2,500 tons of this weight for 1916 requirements. This is the heaviest section which has been adopted for general use up to this time, and while considerably in advance of present practice it is to be expected that other railways will take similar steps. The statistics of the American Iron and Steel Institute show that the same tendency to use heavier rail is common over the country. In 1897, 20 per cent of the total tonnage of rails rolled was of 85-lb. section and heavier. This percentage rose to 25 per cent in 1900, 46 per cent in 1905, 58 per cent in 1910 and to 72 per cent in 1914.

Specifications for Southern Pine

With the large and increasing use of Southern yellow pine for structural purposes in recent years, the need of a standard specification which would insure that a purchaser secures timber of the required quality has become very pronounced. The recent adoption of a definite and uniform specification for this class of timber by the United States Forest Service, the American Society for Testing Materials representing primarily the users and the Southern Pine Association representing the manufacturers, is therefore a big step forward. As outlined in another column, this specification is the result of extensive tests by the Forest Service, followed by a careful study by a committee of the American Society for Testing Materials composed of prominent timber experts. That this specification has also been adopted by the manufacturers is an evidence of their desire to standardize their product. In view of the previous lack of an adequate specification and the prestige this new specification already carries, its general acceptance by railroads would appear to be advisable as they are among the largest users of lumber of this character. At least one road has already definitely adopted the new rules and several others are expected to take similar action in the near future.

SCIENTIFIC STUDY OF THE TRACK LABOR PROBLEM

THAT there has been a decline in the efficiency of track labor no one will dispute. That this decline has been a necessary corollary of American railway and industrial development is not so evident. The fact is that the railways are now suffering largely from the neglect and lack of foresight displayed in the handling of maintenance of way forces in previous years. As long as plenty of intelligent, capable men were available for track work at all seasons it was not considered necessary to work out plans to attract and hold them in the service. When these men began to go to more attractive and permanent employment, the roads failed to observe this sign of warning and to foresee the ultimate result, but relied upon their continued ability to secure all the men they required by their old methods of work, instead of looking to the future and studying means to arrest this transition in its earlier stages. They have failed to realize that labor is a marketable commodity, moving from place to place as inducements are offered and subject to the same laws as other commodities. As a result the track forces have degenerated until today they are the least efficient of any large group in the entire railway organization.

The most unfavorable feature of the present situation and the one which is the greatest handicap to its improvement is the indifference of the large majority of those most directly responsible for maintenance of way work, to existing conditions and the general belief among these men that the deterioration in the efficiency of their forces was to be expected, and that the roads were and are helpless to prevent it. It is natural for anyone to think that his particular department is different from all others, and that local conditions within it make impractical methods which have been found beneficial in other departments or in other industries. Track men have become so accustomed to pointing out the difficulties in the application to track work of the improvements in organization which have been brought about in other industries that, as a class, they have failed to make any serious attempt to improve conditions within their ranks. As long as men are content with these conditions little relief can be expected.

What is needed first of all is an exhaustive and careful analysis of conditions affecting track labor today to ascertain the causes of the present inefficiency and to determine the proper remedies. It would seem that a field such as this would offer almost ideal opportunities for investigation by the proper railroad associations, such as the American Railway Engineering Association, but at the present time almost no concerted attention is being paid to this vitally important problem. At the present time only two of 22 committees of this association are giving any attention to the labor problem and these committees have several other subjects assigned to them for investigation, so that the amount of work they are able to accomplish is very limited. This is in spite of the fact that more money is being expended for labor than for all the materials combined. It would seem only reasonable that at least one committee be permitted to devote its entire time to this subject for which the railroads of the United States are spending over $180,000,000 annually and admittedly without securing the best possible results.

With the inactivity of the railway associations in this field the principal hope for relief at the present time lies in the more or less incomplete plans which are being worked out on a few individual roads, two of which are described in this issue. One of the first essentials of efficiency in any industry is the employment of experienced labor. Such men can only be secured by insuring them permanency of employment throughout the year. This is the fundamental idea underlying the reorganization of track forces of the Long Island. Its success in this regard is indicated by the fact that after 2½ years 90 per cent of the men enrolled originally are still in the employ of this road, in spite of the fact that this line lies close to a large industrial center where labor is in demand.

Another difficulty is the lack of a definite measure of the work performed and of the means to reward a man in proportion to the work he does. The system of organization adopted on four divisions of the Baltimore & Ohio aims to remove these difficulties by determining by careful studies the time required to do certain work and to divide with the workmen the earnings for all work done over a certain minimum.

Many men will raise serious objections to these and other plans as being impractical for track work. They urge the folly of retaining the regular forces through the winter when track work is at a minimum, without stopping to consider the possibility of rearranging track work to reduce the peak load in the summer and to raise the sag in the winter. The Long Island has transferred a large portion of its tie renewal work from the spring months into the fall; and has made other changes in its season's program of operations. The Lehigh Valley has laid practically all of its rail during the winter for the past five years. Other readjustments can be made advantageously if serious consideration is given to this subject. Likewise, many urge that track work, because of its peculiar character, is not subject to accurate measurement, and that local conditions affect performance to such an extent as to render useless any units of measurement adopted, but studies of the same work at different locations and under widely varying conditions on the Baltimore & Ohio show a marked uniformity of results, disproving this objection.

The time has come when the railways must give the track labor problem serious attention. The amount paid for this labor is so large and present conditions are so unsatisfactory that the incentive is certainly sufficient. If railway men will look beyond the difficulties to the possibilities and make serious attempts to remove the fundamental unfavorable conditions which have led to the present situation the efficiency of the labor can be materially increased. It may be too much to hope for the return to the standards of labor existing 20 years ago, but material improvements can be made, and they will only be made when the railways seriously attempt to solve this problem rather than to discuss its difficulties.

AN ENGLISH RAILWAYMAN'S EFFICIENCY.—Vincent L. Raven, the chief mechanical engineer of the North-Eastern Railway, is now temporarily in charge of Woolwich. Lloyd George, the Minister of Munitions, speaking in the House of Parliament on December 20, said that the services Mr. Raven had rendered there had been conspicuous. The manufacture and filling output of various articles has increased since he took charge, in some cases by 60 per cent, in others by as much as 80 per cent, whereas the staff has only increased by 33 per cent. One of the things Mr. Raven initiated was a statistical record of the output.

A System for Standardizing Maintenance of Way Work*

The Practical Application of Scientific Principles to the Organization of Track Forces on the B. & O.

By Earl Stimson

Engineer Maintenance of Way, Baltimore & Ohio

In the spring of 1911 a movement was started on the Baltimore & Ohio to standardize maintenance of way work. From that time the work has been carried forward steadily, resulting in the development of a system of handling maintenance of way track work, which has produced more uniform practices and increased the efficiency of the organization. This has been accomplished by the establishment of standard schedules, indicating the unit performances or the various items of track work, and by keeping a daily record of the performance of each gang. The ratio of the actual performance to the standard schedule is the measure of each gang's effectiveness. By the use of the information thus derived and through the establishment of standard methods, the supervisors have increased the output of the gangs on their territories month by month.

In the beginning the principles of efficiency, as outlined by various authors and experts on shop practice, were used in the formation of a system which would be applicable to maintenance of way work. It was at once seen that several main features must be developed, in order to secure the expected benefits: (1) A method of distributing equitably the available force. (2) Standards for each item of maintenance work. (3) Instructions to foremen to enable them to submit accurate reports of performances. (4) Closer supervision by means of planning and dispatching the work in advance. (5) Simple forms for the notation of records and performances, and for comparison of results. (6) A reward in the form of a bonus as an incentive to the worker to increase his output.

The Philadelphia division was selected as best suited for making the necessary studies and working out the system. It was manifestly impossible for the supervisors to handle special work of this kind together with their regular duties; therefore, each supervisor was given an assistant, who is required to devote practicaly his entire time to the study of standard schedules and methods, to the recording and study of performances and to personal instruction of the foremen in regard to standard practice, etc., but not in regard to the conduct of the work.

The assistant supervisors are all graduates of technical schools, selected from transitmen on the engineering corps, and are eligible for promotion to the position of supervisor or assistant division engineer.

For the first two years the work was confined to the Philadelphia division. By the spring of 1913 a system had been worked out which was giving results warranting its further extension. This was done, and at the present time the standard track work system is in operation on four divisions. On two of these, however, it is applied to only one subdivision. While the development of this sytem has been mainly along the line of track work, its principles are equally applicable and readily adaptable to bridge, building and signal maintenance and renewal work.

Force Distribution

One of the many features contributing to uniform maintenance conditions is an equitable distribution of the available force to the various sections. This has been arrived at by computing accurately the equivalent mileage of each section, and from a monthly inspection of the territory to determine the condition per cent of the principal items of maintenance work. From this percentage and the equivalent mileage the equated mileage is computed for each section. This is directly proportional to the number of men required. For this purpose two forms are used—a record of track and roadbed features and a track condition sheet.

The track and roadbed feature sheet has a number of blank columns at the right for recording the monthly condition per cent, equated mileage and force allotment. In this way one sheet will serve for a period of six months, provided there are no changes in the physical characteristics of the sections. The relative values assigned to various track and roadbed features have been arrived at from records of past charges to these features, extending over a period of years. A column headed "Arbitrary Mileage" is provided to cover unusual conditions not elsewhere provided for. For instance, on a section having track pans, the track at the pans requires additional work, which is a constant factor and may be equivalent to an additional 0.5 miles of main track. In this case 0.5 mile would be allowed as arbitrary mileage. Likewise, arbitrary mileage is allowed to cover special maintenance due to poor subgrade until such conditions can be corrected permanently.

The track condition sheet is prepared monthly and is based on a careful inspection of the road, the condition per cent being the estimate of the existing conditions as compared with the standard of maintenance at which it is desired to maintain the line of road under consideration.

In order to arrive at a more nearly correct result than would be obtained by an estimate of the condition of the entire section, six divisions of the general maintenance work have been made and each given a relative value based on the charges to these accounts for a number of years. An estimate is made of the condition of each of these items on each section, and this, multiplied by the relative value, gives a calculated per cent, the total of which is the condition per cent of the section. The equivalent mileage divided by the condition per cent gives the equated mileage, which directly represents the required force.

Standard Schedules

Standard schedules, or units of performance, are established with great care, as it is essential that they be correct and that the organization of the gang and method of doing the work are the best that can be worked out. The standard performance, or 100 per cent efficiency, is the output of a first-class gang working at a speed which can be maintained continuously without physical harm to the men, following an approved method of doing the work and consisting of the most economical number of men for the kind of work to be done.

To arrive at the 100 per cent standard, first-class gangs are selected and detail time studies made of the performance, the time studies being divided into as many moves and as much detail as possible, in order that the various studies may be compared in detail and a standard method worked out which will eliminate all unnecessary moves. If it appears that an improvement can be made, the organization of the gang and the method of doing the work are altered and new studies made. When the most satisfactory organization and method have been found, a final detail study is made of the performance of the gang, and this is established as 100 per cent efficiency and issued as a standard schedule. In this way schedules have been established for all of the more important items of maintenance work, and many of the minor items are now being studied, with a view to standardizing practically every item of maintenance work. For uniformity, all the schedules are reduced to a unit of performance per ten hours, and all represent a performance which has been attained.

It was at first thought that, owing to the wide variation in

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conditions, there would be a number of items of work for which it would be impossible to prepare standard schedules, but the study of performances has developed a remarkable uniformity in the output of gangs working under apparently widely varying conditions, and there are relatively few items of maintenance work which cannot be standardized. In cases where one standard schedule cannot be made to apply, as, for example, in ditching, a schedule is made for the individual job and is based either on previous records, performances under similar conditions, or observations after the work is started. For individual pieces of work of this kind the supervisor, after careful consideration and planning of a method to be followed, establishes a schedule of standard of output for 100 per cent efficiency, and the foremen's reports are graded on this basis.

Going to and from the work and clearing the track for passing trains represents considerable lost time which is beyond the control of the foreman and men. This lost time is classed as *detention*, and studies made to determine the amount of detention show that road sections average about 10 per cent. Therefore, in grading a foreman's reports for comparison with the standard schedule, a credit of 10 per cent is allowed for detention. On terminal and yard sections the detention is usually much more; in some cases 25 per cent. Sections of this character are treated individually and a study of the detention on each section made.

The following quotations from the book of standard schedules give the standard method of tie renewals when track is not raised; show the detail time distribution and the unit rate per ten hours:

METHOD OF TIE RENEWAL

"Men work in pairs, each starting at ends of the cribs and digging the ballast out of the cribs adjacent to the ties to be renewed. Spikes are then drawn and old tie is worked into the open crib and pulled out of the track. A new bed is prepared and the new tie slipped into place with the tie tongs. One man then holds the tie up to rail by means of bar, and other spikes; each thoroughly tamps both sides of each end of tie outside of the rail and 18 in. inside. The ballast is cleaned and returned to the cribs, dressing the shoulder.

"Not less than two weeks after the renewal, the tie should be thoroughly retamped.

"In pulling new ties into place, the practice of digging picks into the face of a tie and so working it into place must not be allowed. Tie tongs are provided for this purpose."

"TIME DISTRIBUTION OF RENEWALS."

	Stone Ballast Minutes.	Gravel Ballast Minutes.	Cinder Ballast Minutes.
Cribbing out	18	10	10
Drawing spikes	3	3	3
Removing old tie	2	2	2
Preparing new beds	3	3	3
Carrying tie 100 ft.	2	2	2
Placing new tie	2	2	2
Spiking to gage	4	4	4
Tamping	13	8	8
Cleaning ballast and redressing cribs and shoulder (very dirty)	20	3	3
Carrying old ties 50 ft. and piling for burning	2	2	2
Foreman	6	4	4
Total minutes for one tie	75	43	43
Rate, ties per 10 hours	8	14	14

"If any of the above items are not performed subtract the corresponding time with an allowance for supervision from the totals and figure the rate per 10 hours."

The detail time distribution is essential for grading the foreman's daily reports correctly. If all of the details of work shown are performed, then the unit performance for 100 per cent efficiency for tie renewals in stone ballast is eight ties per ten hours. If, however, some of the items are omitted, as is the case when a gang cleaning ballast immediately follows the tie renewal gang, then the work of cleaning ballast, filling the cribs and dressing the shoulder is performed by the following gang, in which case the tie schedule is corrected by omitting this item, which makes the unit rate 11 ties per 10 hours, instead of 8 ties per 10 hours.

It will be noted from the distribution that the new tie may be carried 100 ft. and the old tie 50 ft. If ties are moved more than this distance, they must be trucked, in which case the foreman makes a separate distribution of the time so consumed, charging it to "trucking," which is covered by another schedule.

Instructions to Foremen

To form an accurate comparison of the performance of various gangs, absolute uniformity in the reports submitted by the foremen is necessary. Owing to the difficulty experienced by foremen in preparing reports, it is desirable to make all forms used by them as simple as possible. The daily labor report which has been in use over the Baltimore & Ohio system for a number of years, proved to be well suited to the reports required in connection with the standard track work system, no change being necessary and no additional report is required of the foremen. It is, however, necessary that the distribution shown on the daily labor report be made with considerable care, so that each item of work may be graded correctly. To secure this result detail instructions governing the distribution and reporting of time charges are issued. To insure a correct understanding of the instructions, each supervisor called a special meeting of his foremen, at which time the instructions were explained and discussed item by item. In addition to this, as the assistant supervisor goes over his territory he personally instructs the foremen and sees that the reports are correctly prepared.

Following are typical instructions above referred to:

INSTRUCTIONS FOR REPORTING AND DISTRIBUTING TRACK WORK TIME CHARGES. TO BE USED IN CONNECTION WITH THE STANDARD TRACK WORK SYSTEM

Kind of Work	Manner of Reporting	Items to be Included
Lining	State feet of track lined and whether main or side track.	Breaking down shoulder, lining track, replacing and dressing ballast.
Surfacing	State total number of ties tamped and feet of track surfaced, whether tamping one or both ends of ties, and if main or side track.	Cribbing out, tamping, replacing and dressing ballast.
Gaging	State number of ties gaged, whether with or without adzing, and if main or side track.	Pulling spikes, adzing and respiking to gage.
Laying Rail	State amount laid in feet whether new or repair and if laid in Main Track or Siding. State time placing plates and number of plates. Make separate report of time distributing rail, new or repair and loading rail removed.	Pulling spikes, lining out old rail, adzing, lining in new rail, putting on rail joints, full bolting, full spiking to gage, uncoupling old rail, trucking material, flagmen and water boy. Time consumed removing old plates and placing new plates to be reported separately. Separate report to be made of time consumed unloading.
Replacing Broken and Defective Rail	State number of rails and length and whether new or repair. Show time trucking and distance trucked.	Pulling spikes, lining out old rail, adzing, lining in rail, new or repair, putting on rail joints, full bolting, full spiking to gage and flagmen. If plates are changed make separate charge, also separate time consumed loading, unloading and trucking rail.
Tightening and Replacing Bolts	State number of bolts tightened, number renewed and on which track.	Removing old bolts, putting in and tightening new bolts and tightening old bolts.
Replacing Bolts		
Renewing Cross Ties (Digging in)	State number of ties; with or without plates; kind of ballast and whether main or side tracks. If trucking, show number of ties and distance trucked.	Carrying new tie if less than 100 feet, cribbing out, removing plates, removing old tie, placing new tie, replacing plates, tamping, cleaning ballast and refilling cribs, dressing ballast, carrying and piling old tie for burning if less than 50 feet. If new tie is moved more than 100 feet or old tie is moved more than 50 feet, separate time consumed loading, unloading and trucking.
Replacing Ties	State number of ties and kind of ballast.	Cribbing out, driving tie to place, tamping, replacing and dressing ballast.
Replacing Switch	State weight of rail, length of points and location. Show time trucking and distance trucked.	Removing old switch, placing and bolting new switch, adjusting and flagging. Separate time consumed loading, unloading and trucking.
Cleaning Snow and Ice	State number of switches cleaned. Make separate report for cleaning platforms.	Include time cleaning frog, switch and derail.
Cleaning Right of Way	State amount cleaned by feet of track and give location.	Removing miscellaneous scrap, drift, dirt and other material from tracks and right of way.
Mowing	State amount mowed by feet of track and give location.	Cutting and disposing of brush, grass, weeds, etc.
Ditching	State location, amount in feet and method.	Constructing or cleaning tile or open ditches. Include time placing and removing plank for trucking, laying and removing track for ditching cars, loading, trucking and unloading dirt. If steam ditcher is used special report to be made.

Kind of Work	Manner of Reporting	Items to be Included
Patroling	State distance covered in miles.	When track walker is tightening bolts or doing other work while patroling make separate charge.
Trucking	State amount and kind of material and distance trucked.	Loading, unloading, trucking and flagging. (Any material handled on hand, push or motor cars.)
Ballasting (Preparing roadbed and applying ballast, applying ties)	Distribute time to the following items: Feet of track stripped. Feet of roadbed prepared, number of ties renewed, number of ties respaced, feet of track ballast unloaded and number of cars, feet of first raise, feet of second raise, feet lined, feet of track dressed, quantity, kind of material and distance trucked.	Stripping track:—Digging out and disposing of old ballast from cribs, center ditch and shoulders (If old ballast is used to build standard roadbed section, charge second handling to Preparing Roadbed.) Preparing Roadbed:—Widening and preparing subgrade to receive ballast. Renewing Ties:—Carrying new tie if less than 100 feet, removing old tie, carrying 50 feet, and piling for burning, placing new tie, placing plates, spiking to gage, temporary surface and flagging. Respacing:—Cracking up spikes, driving ties to place and driving down spikes. Unloading Ballast:—Releasing ballast cars. First Raise:—Jacking up track 4" to 6" tamping and flagging. Second Raise:—Jacking up track 4" to 6" tamping to final surface and flagging. Lining:—Throwing to standard centers and detail lining. Dressing:—Dressing center ditch and shoulders to standard section.
Surface and Raise out of Face and Renewing Ties (Applying ties Acct. Surfacing track)	State number ties renewed, number of ties respaced, feet of track lined and feet of track dressed. If ties are trucked, state number and distance trucked.	Renewing Ties:—Carrying new tie if less than 100 feet, cribbing out, removing plates, removing old tie, placing new tie, replacing plates, carrying and piling old tie for burning if less than 50 feet. Respacing:—Driving tie to place. Surfacing:—Cribbing, jacking up track, tamping and flagging. Lining:—Breaking down shoulder, lining track, replacing and dressing ballast. Dressing Ballast:—Unloading ballast to refill cribs, dressing cribs, shoulder and center ditch.

A separate distribution of time must be made for any items of work not covered by the above list. Time charges for one item must not run over into the charge for another item. For instance, in surfacing if there is any lining or gaging, a careful separation must be made to each class of work, and it must not be lumped as surfacing. The time consumed in loading, unloading and trucking material is in all cases included in the cost of applying the material, but a separate distribution of the time consumed on this work must be made. The time spent in flagging must in all cases be charged to the work being protected.

Planning and Despatching

In order to outline the order of the work and to assign it to the gangs to follow in sequence, to reduce the loss of time consumed by unnecessary movement of the gangs from place to place, a system of planning and dispatching the work has been devised. Early in the spring the program of work for the season is decided upon and charted in yellow on separate sheets for each section. Thereafter, as the work progresses and new monthly sheets are prepared, the completed work is shown in green and the monthly program shown in red. A few days before the close of the month the division engineer calls a meeting of the supervisors for the purpose of planning the work of the coming month. The work to be done, the location and the relative order in which it is to be undertaken is decided upon and shown in red on the chart. The quantity of work to be accomplished is computed from the standard schedules and the force allotted for the month. The direction in which the work is to progress, the date on which it is to be commenced, and the calculated date of completion are shown on the chart.

The chart is prepared in duplicate, one copy to be retained by the division engineer and the other for the use of the supervisor. Upon his return to headquarters, the supervisor transmits the program to the foreman by means of work orders, giving him the program for the entire month, or any part of it, as he may see fit. For this purpose a work order, or dispatch book, is provided, bound in stiff-back notebook form, and containing 100 perforated leaves. The work order is made out in duplicate, the carbon copy being filed on the dispatch board, which will be described later. The work order states the kind, location, amount of work to be done and the time to be consumed. Upon completion of the work the foreman dates and signs the order and returns it to the supervisor. The foreman is given a work order for all work to be done. This does not relieve him from the responsibility of making unforeseen and emergency repairs.

The percentage of efficiency of a gang is not measured by the time reported on the work order, as this is not in sufficient detail, but is obtained from the foreman's daily labor report.

For the purpose of recording the performance of gangs two forms are in use: A daily record of track work performance and a monthly record of track work efficiency. As stated above, the foremen submit to the division engineer and supervisor a daily report of work done. The original, which is forwarded to the division engineer, is for the use of the clerical force in making the proper distribution of charges. The carbon copy is used by the assistant supervisor in posting the daily record sheet. For instance, suppose the gang on section 10 consists of a foreman and nine men, working 10 hours per day, and that the foreman has a work order to renew ties without raising track; then the schedule under which he is working will include 8 ties per 10 hours. The foreman's daily report shows that he renewed a total of 64 ties, working 100 hours. The standard time required to renew 64 ties in stone ballast, track not raised, is 80 hours, whereas the actual time consumed was 100 hours. However, 10 per cent of this is consumed by unavoidable delays, passing trains, etc., and is charged to "Detention," leaving 90 hours actually devoted to effective work, which indicates an efficiency of 89 per cent.

All other work is recorded in the same way. A column headed "General Miscellaneous" is for recording work which has not been covered by standard schedules, and such work is given an arbitrary rating of 67 per cent, for investigation has shown that work which has not been standardized is being performed at an efficiency of about two-thirds of what can be accomplished after standardizing. In order to record and grade the foreman's daily reports intelligently it is essential that the assistant supervisor be familiar with the work being done by every section and extra gang on his territory, and this can only be accomplished by constant visits of the gangs and inspection of the work, as many gangs as possible being visited every day.

Although entries of the standard and actual hours are made of every gang every day, the efficiency per cent of the gangs is worked up only twice a month, that is, the close of the semi-monthly payroll period. The efficiency per cent is arrived at by totaling the standard and actual hours for every class of work, including "General Miscellaneous," but excluding "Detention," and dividing the standard by the actual. For information and study a separation is made of the total scheduled hours, which is the work covered by the standard schedules, as the effect produced by the inclusion of the "General Miscellaneous" with the arbitrary efficiency of 67 per cent is to lower the total efficiency. For this reason an effort is being made to work out standards for every possible item of work.

At the close of the month a "monthly record track work efficiency" sheet is compiled from the totals on the "daily record" sheet. This monthly record shows the percentage of efficiency made by every gang on each class of work, the average of every gang on all work and the averages for the subdivision—in other words, an accurate measure of the performance of every gang. When it is seen that some gang is making an exceptionally good record, or an unusually poor one, it is the duty of the assistant supervisor to visit that gang immediately and make a study of its work; if an exceptionally good record is being made, it is his duty to ascertain how the work is being handled, with a view to further improvement of the standard method, and if a poor record is being made, to locate the trouble and instruct and assist the foreman in following the standard method.

A standard dispatch board and filing case has been installed in the office of every supervisor on whose territory the standard track work system is in operation. Each drawer of the filing case is equipped with a name plate, for posting the section number

and foreman's name. In the drawers are filed the daily labor sheets, An upright board at the back is the dispatch board, and, corresponding to the name plate on the drawer, there is a similar name plate on the board, with a hook directly beneath it, on which the carbon copy of the work order is filed. An inspection of the work orders on the board shows the location of every gang on the subdivision, and the work being done. A further inspection of the daily labor sheet file shows the progress being made on the work covered by the orders on file above. A long drawer at the bottom of the case is for the purpose of filing the daily record sheets. The planning chart for each section is kept on file in the drawer with the daily labor distribution sheets.

The Bonus Feature

A great deal can be accomplished by means of the standard gang organizations and methods, and much more by an effective appeal to the individual effort. Such an appeal may be in the form of a published rating of the foremen and gangs according to the per cent efficiency attained, which for a time incites a spirit of competition, the natural desire to excel, but effort based on this alone is not long sustained. It is therefore necessary that the appeal for increased effort be backed with some material reward. This reward is offered in the form of a bonus, or premium, which is the employee's share of the value of the result of his increased effort over the average which experienec has set at 67 per cent of the standard.

The regular daily or hourly rate for the actual time worked is paid, and in addition a bonus graded according to the per cent efficiency from 67 per cent upward. No bonus is paid for less than 67 per cent efficiency. The bonus is a percentage of the wages earned and increases gradually from 67 per cent to 100 per cent, and above 100 per cent at the rate of 1 per cent for each 1 per cent increase in the efficiency percentage. Owing to the nature of maintenance of way track work, it is necessary to consider the gang as a unit rather than the individual, therefore the foreman and each man in the gang receives the bonus based on the efficiency of the entire gang.

The following bonus table has been adopted as standard:

STANDARD BONUS TABLE

Efficiency per cent.	Bonus per $1.00 Wages	Efficiency per cent.	Bonus per $1.00 Wages	Efficiency per cent.	Bonus per $1.00 Wages	Efficiency per cent.	Bonus per $1.00 Wages
67	.0001	78	.0238	88	.0832	99	.1881
68	.0004	79	.0280	89	.0911	100	.20
69	.0011	80	.0327	90	.0991	101	.21
70	.0022	81	.0378	91	.1074	102	.22
71	.0037	82	.0433	92	.1162	103	.23
72	.0055	83	.0492	93	.1256	105	.25
73	.0076	84	.0553	94	.1352	110	.30
74	.0102	85	.0617	95	.1453	120	.40
75	.0131	86	.0684	96	.1557	130	.50
76	.0164	87	.0756	97	.1662	135	.55
77	.0199	87.5	.0794	98	.1770	140	.60

Summary

The benefits to be derived from the standard track work system are both direct and indirect, and may be stated as follows:

1. The roadbed and track feature and track condition sheets provide for a more effective distribution of the forces, resulting in more uniform track conditions.

2. The standard schedules furnish an accurate unit for the measure and comparison of the performance of gangs and an accurate basis for estimating and planning the work to be done.

3. The instructions to foremen provide for a correct and uniform distribution of the time, for the purpose of comparing the performance of gangs, which in turn results in a more correct distribution of charges to the proper accounts, thus furnishing reliable cost data.

4. The system of planning and dispatching the work requires that more attention be given this important feature, and results in a more intelligent direction and intensive supervision of the work.

5. The daily and monthly record sheets place the results obtained in a form for ready comparison, the study of which leads to improvements in methods and points out the weak places in the organization.

6. The increase in efficiency which can be measured accurately by means of the standard schedules and is rewarded by the bonus payment, results in a direct financial gain, both to the employee and the employer.

7. By no means the least of the benefits to be derived from this system is that of the development of the young engineer from an inexperienced transitman or draftsman from the engineer's office into a well-qualified candidate for the position of supervisor or assistant division engineer, from which position he will later qualify for that of division engineer.

A MOTOR WHEEL FOR HAND POWER SPEEDERS

The Smith motor wheel, which has been in use for some time for propelling bicycles, is now being placed on the market for use with hand-power railroad velocipedes as an economical substitute for the regular gasolene car. The device consists of a 20-in. pressed steel wheel with a 2-in. pneumatic tire. The wheel is dished about 4 inches, so that the engine, which is carried on the axle, is partly enclosed within the wheel. The gasolene tank is carried on a mud-guard over the top of the wheel, making

A Motor Wheel Attached to a Speeder

a total height of 26 in. Traction is afforded entirely by the weight of the wheel, which is nearly 50 lb.

The device has been modified from the design used on bicycles only as required to provide suitable means for attachment to the rear of the velocipede. The engine is of the 4-cycle type, air-cooled, 2⅜-in. bore by 2½-in. stroke, and has an aluminum crankcase arranged for splash lubrication. It is equipped with a magneto and is throttle governed by means of a flexible tube containing a wire actuated by a thumb lever attached to the handle-bar or the seat.

This wheel has had extensive use on bicycles, and experimental use connected to railroad velocipedes shows that under average conditions it is capable of carrying one man up a 2 per cent grade. The device is being handled by Mudge & Co., Chicago.

ABSTRACT OF ENGINEERING ARTICLES

The following articles of special interest to engineers and maintenance of way men to which readers of this section may wish to refer have appeared in the *Railway Age Gazette* since December 17, 1915:

Original Cost to Date, Cost of Reproduction, New, and Cost of Reproduction Less Depreciation. These three factors of railway valuation were discussed by J. S. Tassin in a letter to the editor in the issue of December 24, page 1183.

Influence on Rails of the Method of Blooming.—The results of experiments made to determine the influence on the rails of the manner in which the bloom is rolled were described in an abstract from Bulletin 179 of the American Railway Engineering Association in the issue of December 24, page 1187.

Progress on the Erection of the New Quebec Bridge.—Encouraging progress is being made in the erection of this great structure. A report on the present status of the work and an outline of some of the methods used in erection were contained in an illustrated article in the issue of December 24, page 1189.

Segregation and Sponginess in Ladle Test Ingots.—Owing to segregation and sponginess experienced in small ingots made for the purpose of testing,

great difficulty is experienced in obtaining representative analyses. An abstract of Bulletin 179 of the American Railway Engineering Association described this difficulty and the methods proposed for overcoming them in the issue of December 24, page 1196.

Bridge Construction in 1915.—Although the total number of bridges built during the year was unusually small, work was in progress on a number of large and important structures. A brief outline of the year's work was given in an editorial in the issue of December 31, page 1224.

New Railway Construction Statistics in 1915.—During this year 933 miles of new first track was completed in the United States, which is a less amount than was built in this country in any year since 1864. A complete report of the construction during the year was given in detail in the issue of December 31, page 1247. Editorial comment on this unusual situation appeared on page 1224 in the same issue.

Clearance Legislation.—This much discussed subject is again receiving consideration by the railway brotherhoods, by Congress and by various commissions. The need of adequate control of equipment dimensions was discussed in an editorial in the issue of January 7, page 2.

Cold Straightening of Rails.—This subject has been given considerable space recently in the pages of the *Railway Age Gazette*. C. W. Gennet, Jr., gave an account of the mill conditions and practice which affect this phase of rail manufacture, in a letter to the editor in the issue of January 7, page 4.

Improvements at Pawtucket and Central Falls.—The cities of Pawtucket and Central Falls, R. I., have been provided with a new joint passenger station by the New York, New Haven & Hartford. This station, together with the grade separation work carried on simultaneously, was described in an illustrated article in the issue of January 7, page 13.

A Bridge Over the Arkansas River Near Pine Bluff.—A new bridge over the Arkansas river embraces a number of interesting features. This structure, which was designed for use both as a railroad and highway bridge, was described in an illustrated article in the issue of January 14, page 53.

Coal Dock for the Southern at Charleston, S. C.—The Southern recently put in service a coal dock at Charleston, S. C., at an expenditure of $500,000. The coal traffic involved at this dock and the details of its construction were described in an illustrated article in the issue of January 14, page 61.

A NEW RULE FOR GRADING SOUTHERN PINE TIMBERS

Several years ago there was considerable discussion at one of the meetings of the American Railway Enginering Association with reference to the nomenclature to be applied to southern yellow pine structural timbers. While it was generally recognized that the wood from the true longleaf pine was most desirable from a structural standpoint, it was frequently found that timbers having a less degree of density were furnished as longleaf pine. The average engineer was confronted with a problem as to how he could protect himself and be assured that the timbers actually furnished were longleaf. No very definite method for distinguishing the various botanical species of southern pines had been developed until recently, and the confusion incidentally due to the delivery of mixed grades of timber has been apparent to many. It is therefore of considerable interest to note the appearance of a new grading rule for southern pine timbers which, because of the simplicity of its application, should make the future differentiation between different classes of southern pine timbers an easy matter.

The discussion looking towards a definite method for classifying southern pine timbers was initiated by a committee of the American Society for Testing Materials in 1909. This committee formulated a tentative rule, classifying timbers according to the number of rings per inch. It specified that any timbers which had an average of 15 or more rings to the inch as measured in at least 5 inches of a cross-section, should be considered longleaf; that those having 8 to 15 rings should be considered shortleaf, and that any timbers with less than 8 rings (loblolly), should be considered as unfit for structural uses. The basis upon which the committee at that time formulated this rule was a recognition of the fact that the strength of pine timbers was dependent upon the percentage of actual wood fiber per cubic foot. The rule was simply a suggestion, and was never applied widely, owing to the fact that it was soon recognized that the number of rings per inch was not a final criterion as to density. It was, however, the first time that any attempt was made to do away with the botanical classification of timbers.

During the past two years the United States Forest Service has carried on a very extensive investigation, from a botanical and strength standpoint, and as a result of this study a rule was promulgated which was used very successfully in the purchase of timbers by the Panama Canal Commission, and which, in slightly modified form, was adopted by the Southern Pine Association in 1915. Through the co-operation of the United States Forest Service, Committee D-7 of the American Society for Testing Materials was furnished with the various data upon which the Forest Service had formulated its rule, and after a thorough investigation of the matter, and with some slight changes, this committee recommended the adoption of the rule at the last annual meeting of the American Society for Testing Materials in June, 1915. (See *Railway Age Gazette*, July 9, 1915, page 67.) The American Society for Testing Materials unanimously adopted the rule as standard in August, 1915. Shortly after the rule was ratified by the Southern Pine Association, New Orleans, La., and the latter organization has just issued a pamphlet in which the new rule is presented, together with a full reprint of the report of the committee of the American Society for Testing Materials and two papers by Messrs. Betts and Swann, of the United States Forest Service, giving in detail the results of the investigation made by the Government which resulted in the formulation of the new density rule.

Briefly stated, the new rule does away entirely with the botanical classification of pines. It establishes two grades of pine timbers—dense pine and sound pine. The classification is based on the number of rings per inch, the average percentage of summerwood and the degree of sharpness distinguishing the summerwood from the springwood.

It is of course understood that this new classification pertains strictly to the question of strength, and has nothing to do with lasting power. It has been recognized by the railroads for many years that where long lasting power is desired for any structural timbers, the safe way to obtain this is by chemical treatment. The function of resin in prolonging the length of life of pine timbers was taken into account by the committee, and a method was suggested for making rapid resin determinations. The opinion of this question is expressed by the committee in the following statement: "Such method may be used in special inspection when the timber is to be used for special service."

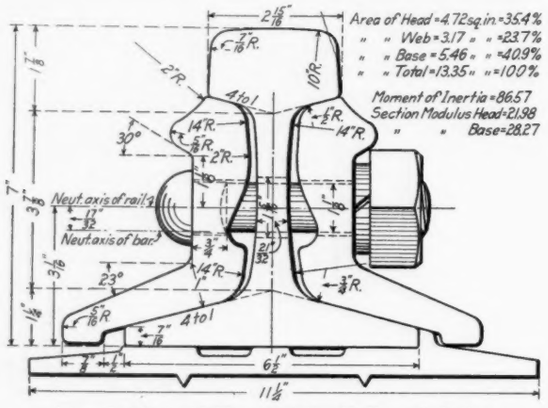
The new rule practically insures that most of the timbers to be furnished under the grade "dense pine" will be botanical long leaf, the timber which experience has shown to have the highest strength value. Open-grained, porous pieces of true botanical longleaf will be excluded, as well as a large percentage of shortleaf and loblolly pines. In other words, the new rule, when carefully applied, will insure getting the dense-grained, heavy pieces of southern yellow pine, without the confusion which has hitherto prevailed when a botanical classification was attempted. The new rule will be found extremely simple in its application, and it has the great advantage over anything which has hitherto been suggested, in that anyone after one or two trials will readily be able to distinguish the two classes, even without the aid of a rule. In any event, the application of a rule by counting a certain number of rings and noting the percentage of summerwood gives a definite method for classifying timbers and is a thing which has hitherto not existed.

From the foregoing it will be noted that the new rule does not change any of the standards hitherto used, except that it makes the certainty of getting a high-grade class of structural timber more certain. Attention is called, in the pamphlet issued by the Southern Pine Association, to the new practice already established by many of the manufacturers of southern yellow pine of branding their timbers, which will enable the consumer to know definitely where his timber comes from and with whom he is dealing. It is to be anticipated that this method, because of its simplicity and practicability, will soon find widespread application.

THE RAILWAYS OF QUEENSLAND.—From July 1 last the railways of Queensland have been divided into three divisions—Southern, Central, and Northern. The Northern and Central divisions are in the charge of the deputy railway commissioner. Out of 11,267 employees on these railways, 437 have joined the colors. Of these 20 have already given their lives for the empire.

A 136-LB. RAIL

The Lehigh Valley has recently ordered 2,500 tons of rail rolled to a new section weighing 136 lb. per yard. This is believed to be the heaviest section ever rolled for general service on a steam road in this country. The rail is 7 in. high and the base


Area of Head = 4.72 sq. in. = 35.4%
" " Web = 3.17 " = 23.7%
" " Base = 5.46 " = 40.9%
" " Total = 13.35 " = 100%
Moment of Inertia = 86.57
Section Modulus Head = 21.98
" " Base = 28.27
Neut. axis of rail
Neut. axis of bar
4 to 1
30°
23°
6½"
11½"

The Lehigh Valley 136-lb. Rail and Joint

is 6½ in. wide or one inch higher and an inch wider than the 110-lb. section now used. The general dimensions and the distribution of the metal are shown in the accompanying drawing. A new angle-bar type of joint was designed for use with this rail, the dimensions of which are also shown.

A WALKING DRAGLINE EXCAVATOR

An interesting innovation in excavating machinery is noted in a dragline excavator equipped with a walking device, whereby the machine is supported alternately on the drum base and on two auxiliary platforms, the drum base and platforms being alternately moved forward or backward, thus giving a motion not unlike that of walking. As a consequence, the machine is much more portable than ordinary excavators of this kind, and plankways or blocking are largely eliminated.

The walking device consists of a steel drive shaft extending across the upper platform of the excavator and connected by gearing to the hoisting engine. At each end of this shaft, just outside of the house, a rotating cam is attached. Each of these cams supports a steel carrying beam, which is pivoted from the cam by a crank pin at some distance from the attachment of the shaft. Chains attached to each end of the carrying beams connect the latter with the two auxiliary platforms, the attachment being such that the paltforms are parallel to the carrying beams.

As the drive shaft revolves the cams and carrying beams lift the auxiliary platforms and swing them forward until they are again returned to the ground by the cam movement in describing a part of a circle. Continuing the rotation of the shafts after the platforms are lowered to the ground causes the cams to come in contact with tread plates on the tops of the auxiliary platforms. The shape of the cams and the treads on the platforms is such that as the rotation of the cams continues the machine is lifted off of the ground and pulled forward and again lowered to the ground some distance ahead of the platforms. Owing to the additional weight of the boom and bucket on the front end of the machine, the center of gravity is some distance forward of the drive shaft, and in consequence the forward end of the circular platform supporting the drum is not lifted entirely clear, but drags slightly on the ground. This gives the necessary three-point support during the movement, and precludes any tendency to oscillation or rocking while the machine is momentarily supported on the auxiliary platforms. When the machine has taken the desired position, the drive shaft is stopped in such a position that the auxiliary platforms are supported free from the ground and are held in that position by a brake. This brake is also used by the engineer to decrease the speed of the machinery during the portion of the rotation when the machine is descending to the ground, and thus any jarring is avoided.

The dragline excavator was introduced by the Monighan Machine Company, Chicago, and was used experimentally by them during 1913. It has been used commercially on both embankment and excavation work during the seasons of 1914 and 1915. Three sizes of machines are made, equipped either with steam or gas engines. The smallest machine has a 40-ft. boom, a 1 cu. yd. bucket and a 45-hp. engine, and weighs 26 tons. The largest machine has a 60-ft. boom, a 3-cu. yd. bucket and a 100-hp. engine, and weighs 77 tons. These machines can walk at the rate of 25 to 30 ft. per min., so that it is entirely practicable to "walk" them to the job. Their mobility on the work has been found an advantage, and by turning the machines on the turntable while walking it is possible to place them in almost any position.

The Walking Dragline at Work

Keeping a Railroad Line Open During Snow Storms

Methods of Preventing Interference to Operation Under Different Climatic and Operating Conditions

At this season of the year the most important problem confronting the maintenance of way departments of the northern roads is that of keeping the lines open during severe storms. This winter has already witnessed several storms requiring emergency measures in one part of the country or another, the New England states suffering most severely.

The two articles given below describe methods customarily adopted to combat snow storms under three different conditions. The first describes those measures put into effect on the Long Island in the vicinity of New York, where sudden and severe storms are frequently encountered, and where it is necessary to handle a very dense traffic without serious interruption. The second article describes the measures which have been found practical in keeping open prairie lines of light traffic in the area between the Missouri river and the Rocky mountains.

FIGHTING SNOW ON LONG ISLAND

By Coleman King
Supervisor, Long Island, Jamaica, N. Y.

One of the greatest sources of worry to an operating man is a snow storm. It is to a railway man a synonym of Sherman's definition of war. Every man from the general manager down to the section laborer dreads a snow storm, not alone on account of the great amount of extra work and additional expense which it involves, but because of the fear of tying up traffic.

Profiting by past experiences, every known means, physical, mechanical and otherwise, is now being used to combat snow storms in the herculean task, at times, of keeping traffic moving. The first and most important essential is the proper organization of snow fighting forces, and the assigning of each man or group of men to a different fixed locality. For several years the Long Island has been endeavoring year by year to perfect its snow fighting force until now all the men are pretty thoroughly conversant with the best method of coping with every kind of a storm.

Early each winter a staff meeting of the heads of the various departments is held, at which arrangements are made for any minor repairs to snow fighting equipment and their locations determined at convenient points on the system ready for immediate use. Our equipment consists of three single track and one double track or side plows, one steam and one electric rotary, one flanger (built on a car), two high wedge plows on engines, and three chloride trains, each outfit consisting of one open gondola with two tanks containing 150 gal. of hydro-carbon each and a closed car containing calcium chloride.

At this staff meeting, the forces are organized, each officer being assigned to a certain machine or territory. As a general rule all of the snow machines are handled by the operating department, with either a trainmaster, assistant trainmaster, road foreman of engines or assistant road foreman of engines in direct charge of each. When it is found necessary to send out the snow plows, the train despatcher notifies the maintenance of way department, which promptly furnishes a foreman or assistant foreman with eight men with shovels to go with each machine. In like manner, four men are sent with each rotary.

In view of the fact that a portion of the system is electrically operated by a multiple unit third rail system from which power is transmitted to the cars through a contact shoe on the top surface of the third or power rail, snow and sleet, particularly the latter, cause a great deal of trouble. To overcome this, train despatchers who are continually keeping posted on weather conditions along the line, notify inspectors and motormen at terminals or intermediate points to fasten down extra tension on contact shoes to aid in cutting the sleet or snow off the third rail surface and keep the shoes in contact with the third or power rail. This extra tension on the ordinary contact shoes is not found wholly effective, and last winter a new slotted or grating contact shoe device for scraping sleet off the surface of the unprotected (uncovered) third rail was tried out, which proved much more effective.

Three calcium chloride trains are also pressed into service on the electric territory, each train consisting of one hydro-carbon car, one calcium chloride car and four multiple unit electric cars. With each train are sent a foreman or assistant foreman and six laborers with six shovels and six hydro-carbon safety cans. Calcium chloride is a solid granular chemical which is purchased in 700-lb. carboys. Before using it is reduced to a liquid solution with 2½ lb. calcium chloride to each gallon of water. This liquid is spread over the third rail through a small hose by air pressure, as the train moves along at a speed of about ten miles per hour. If these chloride trains lose contact in their operation, the six men are then pressed into service, and they clean away the heaviest of the snow and burn off a section of the surface of the third rail ahead of the train with hydro carbon to restore contact and make another start ahead.

Snow, in itself, is no hindrance to third rail electrical operation until such time as it becomes hard and is piled up around the third rail and underneath its cover board, leaving no opportunity for the contact shoe to brush it off; then the shoe slides up onto the snow and loses contact. To overcome this, we have equipped 15 combination multiple unit electric cars with small sheet steel flange plows to remove the snow from between the running rail and the third rail (a total space of 24 in.) to a depth of 1¾ in. below the surface of the third rail, this being 3½ inches higher than the running rail. With these flanges we aim to remove enough of the snow to allow the contact shoe room to brush the snow off the surface of the third rail. In view of the fact that our passenger traffic is practically suspended between 1:30 a. m. and 4:00 a. m., and in order to keep the line open for traffic in case of snow storms during the night, a number of electric trains known as patrol trains are kept moving in the electric zone.

Of next and greatest importance is the assembling of the necessary labor forces to handle the snow removal and the procuring of snow burning liquids. We are now using two kinds, hydro carbon and a snow melting oil for melting snow, ice and sleet in switches and all exposed mechanical switch connections at interlocking plants. Hydro carbon is a by-product from the manufacture of pintch gas, one gallon of which is the residue from each 1,000 cu. ft. of gas generated. Owing to the fact that we make not more than one-quarter of our requirements of hydro carbon, and as we are unable to purchase any in the open market, we get a very fair substitute known as "snow melting oil."

Both liquids are received in 100-gal. drums or in oil tank cars, from which they are transferred into tanks located at different points convenient to where they are to be used. We use gas tanks from old coaches and auxiliary reservoirs from locomotives which hold 150 gal. each. These tanks are set upon frames two feet high, made to fit, and are kept air tight when not in use. Before warm weather sets in, we divide the liquid in each tank, leaving each not more than one-half full, and allow it to remain until the following winter.

This snow melting liquid is drawn off as wanted during snow or sleet storms into safety cans (hydro carbon cans) each with a capacity of 2½ gal. These cans have long spouts similar to those used in spraying fruit trees. When a track man is ready

to use it, he opens a valve in the spout of the can slightly and lights a small piece of asbestos wick, which is fastened on the end of the nozzle. As the liquid flows slowly from the nozzle, it is ignited by the flame and falls on the snow, rail and ties, where it burns for a time in a small flame four or five inches high. The height and extent of the flame can be regulated by the operator adjusting the stream of liquid by means of the valve in the spout of the can. The flame has no effect on the track, as the temperature of the rails is not raised above usual summer heat.

We have found by actual experience that one man with snow melting oil can do more effective work than four without it in keeping switches clean and operative during ordinary snow storms without wind and more than two men if a high wind accompanies a snow storm. Our experience has proven that about 6 gal. of snow melting liquid per hour will keep a double slip switch clear during very heavy storms. We find snow melting liquids indispensible in large interlocking tower plants in terminal yards where we have a large number of double slip and other switches and where we do not have room to dispose of the snow in heaps with shovel and broom, the snow melting liquid having the faculty of absorbing or vaporizing the snow which it melts.

All arrangements for the necessary snow melting liquid and the assembling and organization of the necessary labor forces to take care of the snow removal are made through the office of the engineer maintenance of way. Practically every man in the third rail and signal departments, the bridge and building department, and the construction department are pressed into service, in addition to track forces. Third rail forces are assigned to the most important points on electrified territory and signal forces are assigned to the various signal and interlocking plants. Portions of the bridge and building forces are assigned to the various stations on the electrified zone to keep snow cleared off the third rail and platforms, the balance being kept in reserve. Portions of the construction department forces are assigned to different terminals to assist the permanent forces, the balance also being held in reserve. All track department forces are assigned.

In case of a snow storm starting during the day time all of the various department men leave their regular work and report for snow duty, those assigned going direct to the point of assignment, and those not assigned reporting at headquarters at Jamaica, from which point they are sent out in groups on snow plows, rotaries, chloride trains, patrol trains, etc., as previously mentioned, and to assist or relieve assigned forces if the storm is severe or protracted. In the case of a snow storm starting at night, after the men have gone home, the forces are gotten together by a calling system. Each foreman has a telephone in his own home or furnishes a telephone number close by where he can ordinarily be reached on short notice. We have at Jamaica a night caller during the winter months, whose only duty is to call all of our section and extra gang foremen whenever wanted for snow or other duty at night time (about 20 foremen reside in Jamaica). Each foreman promptly calls his own men and gets them out to their assigned locations within 1½ hrs. Night signal repair men at outlying stations call the section forces at their locations. The train or crew dispatcher calls the supervisors, trainmasters, etc., by phone at their homes, all of whom promptly report at their offices. If it is decided then that the storm has any indications of becoming serious, the construction department forces are called out During severe snow storms the men in the engineering offices are also assigned to the most important towers and junction points. Their duties are to report on conditions from time to time during the storm, to call for assistance if needed, to make notes of any defects or remedies and to render a report after the storm has subsided.

At Jamaica five old coaches ar fitted up with necessary cook stoves and tables and all men working in the vicinity of Jamaica are furnished sandwiches and coffee when needed. The foremen at all points are instructed to purchase food for their men and render a bill therefor, which is paid by the company. This authority applies only in cases where men are taken away from their home locations.

In an endeavor to eliminate as far as possible cuts that shelter snow which after a time forms deep drifts, where it is possible to do so such cuts are sloped with a 4 or 5 to 1 slope, bringing the toe of the slope to the outer edge of the base of the ditch line 22 in. below the level of the top of the rail, thus eliminating shelter for snow to lodge and allowing free action for the wind to blow it out of the cut.

KEEPING THE LINE OPEN ON THE PLAINS

By W. G. Dungan
Division Superintendent, Chicago, Burlington & Quincy, Sterling, Col.

On the plains lying immediately east of the Rocky mountains, high winds with snow are of frequent occurrence during the winter. At these times the problem of keeping the traffic moving on main and branch lines is a serious one. Fortunately, the main lines in this part of the country have been well located from a snow fighting standpoint; a very small part being in excavation, and what few cuts existing having been widened on the north or west sides to provide room for snow drifts.

We receive advice from the connecting divisions and neighboring roads concerning the approach of severe storms. This enables us to make the necessary preparations, although on account of the uncertainty of the extent or the path of the storm, very little actual good can be accomplished until the storm strikes and it is determined just where the trouble is going to arise. When reports indicate that a storm is approaching, extra engines are held at terminals to double-head passenger trains if needed, and the tonnage of freight trains is reduced so that there will be no danger of having the line blocked with a train stalled on the main track. The local officers station themselves where trouble is expected, to take charge of snow plows.

One or more snow plows are held at each subdivision terminal where engines and crews lay over. A common type of plow in use is an all-steel square-nosed plow designed to be mounted on the pilot beam of a locomotive or on one end of a ballast or flat car. It seems to be more desirable to have these plows mounted on a separate car rather than on a locoomtive, and this is the present practice. Any class of locomotive that is available can be used with the push plow. It can be set out at an intermediate point when the extent of the storm is limited and it is not necessary to go to the end of the division. The plow can be trailed back to the subdivision terminal. A simple turnbuckle raises and lowers the nose of the plow, so that the shoes can be raised 12 in. above the rail when trailing the plow.

In addition to these push plows, a plow of the rotary type is held at a convenient location for the protection of two or more divisions. When a storm comes, section foremen make frequent reports to headquarters as to the extent of the drifting. Snow plows are not started out until drifts two feet or more are reported, as traffic can be kept moving for several hours through the lighter drifts.

On the main line a push plow is handled by one locomotive. No special preparations are made except to cover the coal and engine tank with a tarpaulin and board up the front cab windows. No selection of enginemen is made for these trips, freight crews standing first out being called.

A trainmaster, roadmaster, or road foreman of engines always has charge of a snow plow. A small gang of five or six men with track tools and snow shovels is taken in the way-car. Except under extreme conditions, one engine with a push plow has no difficulty in opening up the line where the drifts do not exceed six feet in depth. On the return trip side tracks are plowed out. No special preparations are made for taking care of men on these trips, as they can be fed at the towns along the line.

The most difficult problem in this section of the country is to keep the branch lines open, especially during the month of March, when the snow is wet and often mixed with sand and

dirt. It frequently happens that branch lines are tied up for several days. The rotaries are needed more for opening up branch lines than for use on main lines. Owing to the use of lighter locomotives on branch lines, two or three engines are required to handle the push plows. On account of the danger of derailment it is found best to have only one engine attached to the plow when bucking snow, the other engines being used for a "drag-out."

The push plows are able to open the line when the drifts do not exceed 10 ft. in depth. A gang of 15 to 25 snow shovelers are taken when it is known that it will be necessary to buck snow and the snow plow and engine will have to be shoveled out. On trips of this kind a boarding car, with extra coaches for the men to sleep in, should be provided. Very little is gained by trying to buck snow with a push plow after dark. It is much safer and usually as much progress can be made by doing this work only in daylight. All drifts should be examined before sending a snow plow into them, and all side drifts should be leveled down before going into them with the snow plow, as a derailment will invariably result if this is not done.

When the drifts exceed 10 ft. in depth a rotary is ordered out. Two and sometimes three branch line engines are required to keep it crowded up against the snow. Double crews for all the engines should be provided, so that the rotary can work continuously. A car of engine coal should be taken in the train, and a boarding car, with extra coaches, should be provided for the men. Four or five section men with track tools and snow shovels should be taken along to help coal engines, shovel out switches and do other emergency work. A machinist should go with the rotary, to make light repairs if necessary. A rotary is only able to make a speed of five or six miles an hour while working, and for this reason it is much more desirable to open a line with a push plow, if it can be done.

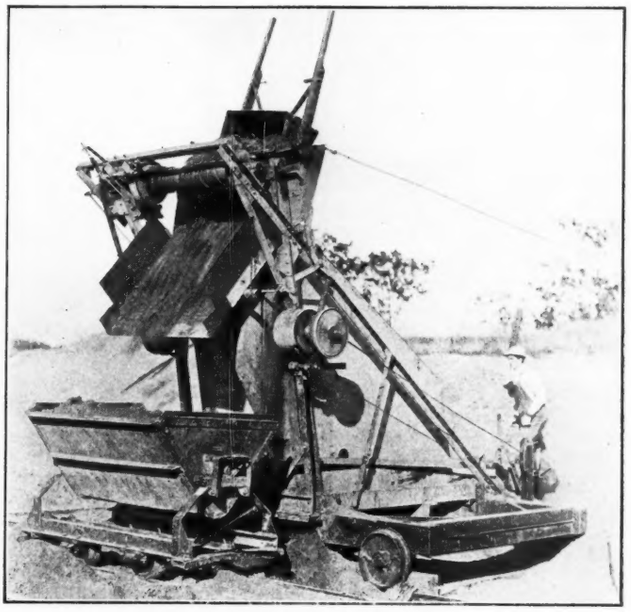
THE ALBRECHT EXCAVATOR

The Albrecht excavator and loader is an excavating device for loading wagons and trucks which has recently been put on the market by the T. L. Smith Company, Milwaukee, Wis. It consists essentially of a hoisting engine toward which a No. 1 Austin scraper is drawn by a ⅜-in. drag line and which, upon

The Albrecht Excavator Loading a Wagon

arriving at the machine, is hoisted in a lifting apron through one quadrant of a circle and dumped through a spout into a wagon standing alongside. A ¼-in. retrieving line hauls the scraper back to the point of beginning.

The machine is compactly built. A structural steel frame supports the discharge spout and the drums and clutches for the hoisting and retrieving cables. The 12 h.p. Fuller & Johnson horizontal gas engine, which furnishes the power, is housed in a No. 16 gage steel box located inside the framework. The lifting apron consists of a scoop-shaped steel plate box supported on the end of two structural steel legs pivoted at the lower front corner of the framework. Two men are required to operate the machine, one to handle the two levers controlling the clutches, and the other to start the scraper. The accompanying photographs illustrate the operation of this machine. Suffi-



The Albrecht Excavator Used With Industrial Cars

cient cable is provided to start the scraper at a point 75 ft. away from the machine. As the machine is mounted on wheels, it is shifted readily from point to point and is easily moved to other jobs. Another advantage is that the material may be removed from a depth considerably below that at which the machine is standing, obviating the necessity of a climb for the wagons. It is said that a round trip of the scraper can be made in less than one minute.

NEW YORK CENTRAL TRACK INSPECTION

The results of the annual track inspection of the New York Central Lines East of Buffalo have recently been announced. The inspection on the main line and on the West Shore was conducted by the main committee and on other lines by subcommittees from other divisions. A. M. Clough, supervisor of subdivision 23, Syracuse division, Batavia, N. Y., received the highest rating for a supervisor with 84.2, C. J. Redifer, supervisor of subdivision B, Electric division, New York City, received the second highest supervisor's rating of 83.7, and W. N. Skelton, supervisor subdivision 7, Mohawk division, received the third highest rating of 83.6. The Electric division received the highest rating of the four main line divisions with an average of 83.7. John Sheridan, foreman of section 2, subdivision 23, Syracuse division, received the highest individual rating of any main line section foreman with a mark of 85.3 Joseph Masulla, foreman of section 6, subdivision B, Electric division, received the second highest rating of 85.2. This is the fourth year that the highest rating has been given to the same supervisor and foreman. During these four years, no extra gang work of any kind has been done on the section receiving this recognition.

No cash prizes were awarded to the supervisors, but the foreman having the best track on each supervisor's subdivision receives a premium of $3 per month for the ensuing year, while the foreman having the best section on each division except on the Electric division, receives an additional premium of $2 per month during the year. Premiums of $2 per month were also awarded to nine foremen of branch line sections and of $3 per month to 10 foremen having charge of yard sections.

The Permanent Track Organization on the Long Island

For Two and One Half Years No Reductions in Forces Have Been Made. Greatly Increased Efficiency

By G. P. Williams
Asst. Engineer Maintenance of Way, Long Island, Jamaica, N. Y.

In the early part of 1913 work of all kinds on Long Island was plentiful, the demand for labor being far in excess of the supply. This, in conjunction with the increased cost of living, caused a corresponding increase of wages. Contractors, farmers and others who required a large number of laborers during the summer months were quick to realize this, and paid as high as $2 per day for the common, ordinary, every-day Italian laborers, to attract the required number of men. The result was that the Long Island Railroad was getting only the poorer class of laborers, as its rate at that time was but $0.15 per hour. Even these men only worked until such time as they also were able to get the higher rate elsewhere. This condition became so serious that it was necessary to do something to counteract it. It was felt that if the organization and the program of work for the year could be rearranged so that laborers could be promised permanent employment, we would be able to attract a desirable class of men, in spite of the fact that it was paying smaller wages.

Consequently on May 16, 1913, a permanent all-year-around section force was organized. The average mileage of each section is 5½ miles of main track and 4½ miles of sidings. Including the sub-foremen, the average force per section is 4½ men over the entire system. The first step in this organization was to divide the sections into five classes—the first class including the important terminals and yards. Each successive class was reduced one man under the new scheme. The eighth class, or the one with the smallest force, was allowed four men, including the sub-foreman, as compared with five men under the old arrangement. The accompanying tabulation shows the number of classes, together with the number of laborers under both the new and the old arrangements. Under this plan the entire section force on the railroad was decreased about 20 per cent. At the same time the rate of pay of all the laborers was increased from $0.15 per hour to $0.16½ per hour, and for the sub-foremen from $0.16 to $0.18 per hour. The wage of the section foremen was also increased from $5 to $15 per month, depending upon the importance of the section.

CHANGES IN THE TRACK ORGANIZATION IN MAY, 1913, ON ACCOUNT OF PUTTING IT ON A PERMANENT BASIS, BOTH AS TO THE NUMBER OF MEN AND COMPENSATION

Class	Number of sections in each class	Number of laborers per section under old arrangement	Number of laborers per section under new scheme	Total of laborers under old arrangement	Total of laborers under new scheme
1	1	10	8	10	8
2	2	8½	8	17	16
3	3	8	7	24	21
4	6	6½	6	39	36
5	32	6 1/3	5	203	160
6	32	5½	4	176	128
7	1	4	4	4	4
8	22	5	4	110	88
				583	461

When this plan was put into effect the foremen were all carefully drilled as to just what was expected of them under the new organization. They were instructed gradually to weed out the poor men in their gangs and to replace them with better ones, using good judgment, however, so as not to cripple their sections by letting all the inferior men go at once. Married men and those having previous experience in track work were given the preference as far as possible. It was also made clear to the foremen that they would be held strictly responsible for the quality of men they selected. One of the great troubles experienced at first in selecting men was that the Italian foremen (about 70 per cent of the Long Island forces being of this nationality) were inclined to favor their relatives. This condition was, however, nipped in the bud, and the foremen were given to understand that such favoritism would not be tolerated. In employing laborers they were given to understand that they could depend on being permanently employed if they gave satisfaction, and that they would not be dropped without good reason. They were also impressed with the fact that they would receive the same treatment that men of a higher grade in railroad employ are usually accorded. In other words, they would be granted a hearing by the supervisor in charge of his division, if they were not satisfied with the decision of their foreman. The scheme has worked out so well thus far that on the entire system there have been only one or two cases where men have applied to the supervisor for redress, and in each of these cases it has been found that the laborer himself was at fault.

After all these points were thoroughly drilled into the section foremen, the office took up the question of arranging for a systematic distribution of the work throughout the year. The first step was to re-arrange the practice of making tie renewals. Under the old arrangement practically all such renewals were made between the middle of March and the first of July. This, of course, required (under the old scheme) a very large increase in the section force and also the use of extra gangs. Under the new scheme tie renewals are started about the middle of October, as soon as the heavy summer passenger travel is over, being careful, however, not to continue the work so late in the season as to cause the track to be frozen up without having had the ties properly seated. This is a condition, however, that does not interfere very much on Long Island, in view of the fact that practically the entire system is ballasted with cinder and gravel ballast and the drainage all over the island is excellent, practically the entire sub-surface being sand. Such tie renewals as the forces are not able to complete in the fall before freezing weather sets in are made in the spring, as soon as the weather conditions are favorable and are completed before July. It is practically impossible on Long Island to renew any ties or do any work during the summer months on account of the heavy travel and on account of the necessity for oiling the roadbed to keep down the dust. Wherever it does become necessary, to disturb the roadbed, the foremen re-oil the part so torn up by the use of hand sprinklers, each section being furnished with several barrels of oil.

During the three summer months when traffic is heavy and work on the main track is necessarily suspended, all necessary repairs are made to sidetracks, including tie renewals and the mowing of the right-of-way. The law in New York makes it compulsory to do so twice a year; the first time between June 20 and July 10; and the second time during the latter part of August. During this period the necessary frog, switch and guard rail and switch timber renewals are made. The period from September 1 to October 15, is devoted to the improvement of the line and surface of the main track, cleaning ditches, trimming ballast and doing the necessary policing for the annual inspection which usually takes place about the middle of October.

As a result of the markings of a Committee appointed for the purpose, the Long Island gives a number of prizes to the men who have maintained the best line and surface on their respective territories during the year. There is a supervisor's first prize awarded to the supervisor having the best line and surface, a supervisor's second prize awarded to the one having the second best line and surface, and a supervisor's third prize awarded the supervisor who has made the greatest improvement on his division during the course of the year. On each supervisor's division two prizes are given to the section foremen; for the best and second best sections. This company has been doing

this for a number of years and experience has shown that it is a very productive investment. There is no question but that the expenditures is paid many times over by the quality and quantity of the work done, as it creates an intense rivalry not only between the laborers, but also among the supervisors.

After the track inspection work is concentrated on making main track tight, renewals are commenced and prosecuted vigorously until the weather prevents. As soon as the ground freezes and throughout the winter the section gangs devote their time to cleaning culverts and drain openings, repairing right-of-way fences, renewing frogs, switches and guard rails and such minor repairs to track fastenings as may be necessary, repairing and renewing crossing plank, track signs, track gauging, installing tie plate and the distribution of ties for spring renewals. This work is done practically in the order named.

In addition to this, of course, the section gangs take care of the usual snow and ice troubles together with other incidental jobs that can be handled during the winter months. The aim is to be as far advanced as possible, so that when the weather moderates in the spring the force will be able to do the work allotted to the spring months. Bolts are tightened at the same time that the surface imperfections are taken care of in the spring and fall.

Practically all of the rail relaying in the construction of new tracks is done by extra gangs. This organization and distribution of work has been in effect nearly three years, and it has been found that the assurance of permanent employment at a fair rate of wages has practically eliminated the shifting about of men and the consequent necessity of breaking in inexperienced men. At the present time fully 90 per cent of the same men are still in the service who started at the time of this re-organization and the section forces are made up of the best class of labor obtainable for this kind of work.

The experience on this road has proven to the satisfaction of the officers that the solution of the track work problem lies in the permanency of the section force. The line and surface on the railroad has been improving steadily. The efficiency is the outgrowth of experience and everything that tends to efficiency naturally reduces expenses. As mentioned previously, practically the entire section organization is made up of Italians. The majority of the laborers are not able to read or write English and some cannot even read or write their own language. Realizing that from these laborers the section foreman is developed the road has established a free correspondence course for the instruction of these men in English and arithmetic. The pamphlets furnished them for study are printed both in Italian and English. The men have taken this work up eagerly and several hundred have already enrolled in the course. Some lessons are also devoted to track work, the safety first idea and suggestions as to good citizenship. The course also consists of lectures by Italian lecturers who are able to explain to these men, in their own language, some of the things that otherwise would be difficult to teach them. As an illustration, one of the pamphlets gotten out for them was one dealing with the subject of naturalization.

HAND OPERATED CONCRETE MIXERS FOR SMALL JOBS

With the development of concrete construction methods it has become customary to use a concrete mixer whenever the yardage of concrete is sufficient to justify setting up a mixer and the organization of a gang of sufficient size to operate the plant properly. There are, however, many small jobs, particularly in railroad maintenance, on which it has been found cheaper to mix the concrete by hand, even though the unit labor charge is higher than with a mixer. Also, men dislike very much to do this work.

As an alternative to hand mixing on small jobs, attention is directed to the encouraging results which have been obtained during the past season on the Rock Island with a hand-operated mixer of small capacity that is used economically with a gang of not more than five men and a foreman. These mixers have been used on concrete piers, backwalls, sidewalks, patchwork, small concrete box culverts and track scales; in fact, on almost any jobs with yardages up to 100 or 125 cu. yd. One of them was used for a job involving 300 cu. yd. of concrete.

This mixer is of about 4 cu. ft. capacity, and consists of a drum 20 in. in diameter and 30 in. long, turned by a hand crank. It is built by The Northfield Iron Company, Northfield, Minn. The mixer is mounted on a wooden frame and can be moved readily from one place to another around the work by two or three men. The charging spout, 30 in. wide, stands about 3½ ft. above the ground level. Owing to its small size it is generally found convenient to place it where it can be discharged directly into the forms, moving it from one place to another as often as is found necessary. It is charged either by shoveling directly from conveniently located material piles or by building a platform even with the charging spout and dumping from wheelbarrows.

Owing to the small capacity of the mixer it is found impracticable to make the proportions by delivering the materials to

Charging the Mixer with Shovels Direct from the Material Piles

the mixer with separate wheelbarrows for the stone, sand and the cement, although in case of the use of bank run gravel it is possible to dump in a single wheelbarrow full of gravel with the desired quantity of cement. Where sand and stone are used the proportions are made conveniently by counting the number of shovels full of sand, stone and cement, either in throwing them directly into the mixer or in loading wheelbarrows, one charge to each load. Stone larger than that passing a 1½-in. ring is liable to clog the outlet spout.

Two men are required to turn the mixer. As a rule two others are needed to load and wheel the material, and a fifth man to take care of the water and cement, and to assist the two men wheeling. It is found that the men operating the cranks on the mixer prefer that job to either hand mixing or wheeling the material. Where the concrete is wheeled from the mixer to the forms, more men, of course, are necessary.

Among other work good results were obtained with one of these mixers for some building foundations and a turntable wall at Cedar Rapids, Iowa, involving a total of 300 cu. yd. of concrete. The concrete materials were delivered to the mixer on an elevated platform in batches of one wheelbarrow-full each. The wheelbarrows were moved in a circle, passing in turn the piles of sand, crushed rock and cement and the mixer. The mixture was 1:2:4, using rock passing a 1¼-in. ring. The concrete was dumped directly in the forms, the mixer, platform and runways being moved as often as necessary to permit this. The cost for handling and mixing the concrete under these conditions toaled $1.72 per cu. yd.

American Wood Preservers' Convention at Chicago

The Report of the Twelfth Annual Meeting Held This Week, Including Abstracts of Papers and Discussions

The twelfth annual convention of the American Wood Preservers' Association was held in the Hotel Sherman, Chicago, on Tuesday, Wednesday and Thursday of this week. The steady and continued progress of the association was reflected in the reports of the officers, which are abstracted below.

The officers for the past year were: President, J. H. Waterman, superintendent timber preservation, Chicago, Burlington & Quincy, Galesburg, Ill.; first vice-president, H. S. Loud, chief engineer, U. S. Wood Preserving Company, New York City; second vice-president, Lowry Smith, superintendent of tie plant, Northern Pacific, Brainerd, Minn.; third vice-president, F. D. Beal, general manager, St. Helens Creosoting Company, Portland, Ore.; secretary-treasurer, F. J. Angier, superintendent timber preservation, Baltimore & Ohio, Baltimore, Md.

The convention was called to order at ten o'clock on Tuesday morning by President Waterman. J. W. Kendrick consulting engineer Chicago, welcomed the convention to the city and discussed the interest of the railways in wood preservation. While stating that the ideas of conservationists that the timber supply is rapidly disappearing are exaggerated, he emphasized the importance of giving timber preservation close attention and especially of giving treated timber protection against mechanical destruction. He strongly deprecated attention to first cost only at the sacrifice of protection by tie plates and other means, he also strongly opposed lowering standards of timbers accepted for ties. He urged on the association the preparation of standard forms for use by all roads, showing mileage of all tracks classified by main and side tracks, the number of ties in tracks, number received each year and increase or decrease as compared with the previous year; this would provide accurate information of tie conditions.

President Waterman in his address urged the creation of a research committee to investigate new methods also patents and ideas for the benefit of all. He also strongly deprecated any tendency towards commercialism in the association as the purpose of this organization is to secure and disseminate all information concerning wood preservation. As 95 per cent of the treated timber is used by railroads they should have full access to the facts.

The report of F. J. Angier, secretary treasurer, showed a cash balance of $766 and a total membership of 276 an increase of 11 over last year.

CREOSOTED PILING AND POLES

By Frank W. Cherrington
Chief Engineer, The Jennison-Wright Co., Toledo, O.

Statistics show that nearly 1,500,000 cu. ft. of poles, averaging 30 ft. in length, and 8,062,000 cu. ft. of piling, averaging 40 ft. in length, were given a preservative treatment in their entirety, by an efficient creosoting process in 1914. Many piles are creosoted annually for use in warm sea water as a protection against marine borers. Poles are also creosoted in great numbers in very warm or moist climates as a protection against decay. But until recently little has been done along this line in the more northern climates, where immense quantities of untreated piling and poles are annually destroyed because of decay.

The decay of a pile (except in warm sea water where it is attacked by marine borers below the water line) will, without exception, originate at the wind and water line. With the exception of a short distance above and below this line, the balance of the timber will remain solid and sound for many years, but that portion subjected to alternate wet and dry conditions, will deteriorate rapidly in strength and usefulness. Similarly, telephone or telegraph poles decay rapidly only at the ground line, except in very warm or moist climates, because that portion of it in close contact with the soil will continually absorb moisture.

The useful life of untreated oak piling in the Chicago river has been found to be about 8 years. At the end of that time the wood becomes so soft that spikes are withdrawn very easily upon any slight stress or strain. Experience with piling in other localities warrants the assumption that creosoted piling will give a life of at least 24 years.

Many engineers would specify creosoted piling and poles more generally for structural purposes, if it were possible to efficiently creosote under pressure, at low cost, only those portions of such materials as are exposed to rapid decay. The city of Chicago, for instance, although now using creosoted piling of necessity, pays for creosoting the entire length of the pile, when about 75 per cent will not be exposed to decay. About 30 ft. of a 45-ft. pile is constantly submerged beneath the river and would never decay, while about 12 ft. only protudes and is subject to deterioration, unless creosoted. Piling and sheating below the water are always in perfect condition, unless the water is infested by marine borers.

Beyond question the most efficacious method of treating any timber is by using some process employing a hydraulic pressure to insure a thorough penetration of the preservative throughout the wood volume. Penetration is essential to the permanence and effectiveness of the treatment, and without pressure, maximum penetration may not be secured. The prevention of decay by the application of preservative oil is permanent or temporary, depending upon the efficiency with which penetration is obtained. Any superficial coating of preservative oil upon the surface of the exposed portion of the timber, such as painting with a creosote or carbolineum, or dipping a portion of the timber in the preservative, is at best but a temporary expedient. Therefore, any process which may do away with makeshift treatments, and place the butt treatment of poles and piling upon a scientific, economical and efficient basis, deserves careful consideration.

Until recently, engineers have considered it impractical as well as impossible to treat, by the injection of creosote oil under pressure, the butt only of piling or telephone poles. The writer understands that there is now in process of development, at least one practical means of accomplishing this end, by providing a vertical cylinder for injecting by any standard process, any required amount of preservative into the butts only of piling or poles, while the upper portions of the timbers are merely surrounded by the compressing medium, air.

Such a butt treatment of piling or poles with pressure by means of a vertical cylinder would accomplish the following results: (1) It would place the butt treatment upon a strictly reliable and scientific basis. (2) It would permit more than a mere treatment of the sap wood. (3) It would place under control the amount of creosote injected per cubic foot of timber. (4) It would allow any desired process of preservative treatment to be utilized at the butt only of a pole or pile. (5) It would reduce cost of pressure treatment without reducing efficiency of preservation. As the same penetration of preservative is secured at the vulnerable air and water line, or air and ground line portion, as if the entire timber is treated under pressure.

Creosoted piling and poles treated in their entirety are an economical investment. And a lower priced, equally efficient means of treating only these parts of such timbers so susceptible to rapid decay, should, upon perfection, accelerate the adoption of creosoted piling and poles on a much larger scale.

METHODS OF CREOSOTING DOUGLAS FIR TIMBER

By O. P. M. Goss
Consulting Engineer, Seattle, Wash.

While in charge of the Seattle timber testing laboratory of the Forest Service, the writer had unusual opportunity to study the effect of commercial treatments on the strength of Douglas fir bridge stringers. The results of these investigations show that bridge stringers treated by the boiling and steaming processes lost from 33 to 35 per cent of their original strength. Owing to this loss in strength, it was necessary to use low fiber stresses in the design of structures built of creosoted timber. In an effort to eliminate this difficulty a large number of experiments have been made with various treatments, and that which has been found to date to give the best results is discussed in this paper.

There are two general classes of structural timber, as follows: that which must retain its full strength after treatment and that in which the strength is not so important, the real problem being that of protection. No difficulty has been experienced in the past in handling the second class of material. The trouble has been entirely with the first class. It has been possible to secure a good oil penetration by both the steaming and boiling processes. From experiments which have been made it has been shown that high temperatures and high pressures in these treatments are largely responsible for the loss in strength of the wood. The temperature used in the boiling process was lower than that used in the steaming, but was applied over a much greater period of time. In recent experiments both temperatures and pressures have been reduced and the vacuum made to take a more important part in the process. The most successful treatment yet devised for treating bridge stringers and similar forms without loss in strength is that of "boiling under a vacuum." When green timbers are creosoted by this method the treatment requires approximately 26 hr., and is, in general, as follows: The timbers are placed in the retort and creosote oil introduced at a temperature of 160 deg. to 180 deg. F. Heat is applied, and the temperature of the oil is gradually raised to 190 deg. F. and held at that temperature for 5 to 6 hours, a sufficient length of time to warm the timbers through. When the timbers are thoroughly warmed, a vacuum of 24 to 27 in. is drawn on the oil, still holding a temperature of 190 deg. F. This vacuum is drawn through an overhead pipe extending from the top of the retort for 36 ft. vertically into the air and returning to the condenser. The purpose of this pipe is to prevent the creosote oil from boiling over into the condenser while boiling under the vacuum. This vacuum is started at 16 to 18 in., and as the timber seasons, is gradually raised to 24 to 27 in. The full period of vacuum is 12 to 16 hr. It is continued until the rate of seasoning of the timber is 0.1 lb. of water per cubic foot of wood per hour. After this finished rate of seasoning is reached the vacuum is broken and the pressure on the oil started, which rises as high as 120 to 135 lb. per sq. in., and continues over a period of 4 to 6 hr. The temperature of the oil during the pressure period drops from 190 deg. to 180 deg. F. By this process 10 to 14 lb. of oil per cu. ft. may be pressed into the wood.

This method of treatment is a modification of the Boulton process, and at the low temperatures used seasons the wood even better than the old boiling process which employed much higher temperatures. Timbers treated by the method of "boiling under a vacuum" are noticeably easier to press than timbers treated under the old boiling process. The edges of the checks which develop, due to seasoning, are very sharp, showing that the wood is not burned at all.

In order to carry the test still farther, and to determine the effect of this treatment upon the strength of Douglas fir bridge stringers, two shipments of full sized stringers were selected, and treated in four different charges at the plant of the St. Helens Creosoting Co., St. Helens, Oregon. These stringers were of three sizes, 7 in. by 14 in. by 28 ft., 7 in. by 16 in. by 30 in., and 10 in. by 14 in. by 28 ft. They were carefully selected so that the two halves were of equal quality, cut in the center, and one-half creosoted and tested, and the other half tested in its natural green condition. The 7 in. by 14 in. and the 10 in. by 14 in. stringers were tested on a 13-ft. span, and the 7 in. by 16 in. stringers were tested on a 14-ft. span.

All stringers were tested under one-third point loading. The strength tests were made on the treated material within approximately 10 days after date of treatment. The untreated stringers were tested in a green condition. All tests were made by the Bureau of Standards, Portland, Oregon, in accordance with United States Forest Service standard methods, and a complete report was rendered on the tests.

Based on the modulus of rupture, the average strength of the 7 in. and 14 in. treated timbers was 101.2 per cent. that of the natural. In three sets of these stringers the treated showed less strength than the natural, while in six sets the treated showed greater strength than the natural. The modulus of rupture of the 7 in. by 16 in. treated was 101.8 per cent. that of the natural. The modulus of rupture of the 10 in. or 14 in. stringers treated to be 95 per cent. that of the natural.

The average for the 16 pairs of stringers, based on the modulus of rupture, shows the treated stringers to be 99.2 per cent as strong as the natural.

These results show conclusive proof that Douglas fir bridge stringers can be creosoted effectively without injuring their strength, a fact which should be of interest particularly to railroads, and also to other consumers of structural timber.

Discussion

George M. Hunt of the Forest Products Laboratory, Madison, Wis., stated that tests on small timbers treated by the method described and tests on others by a similar method gave equally favorable results. He stated further, that it was the intention to make tests on full size timbers after treatment according to these methods at a commercial plant. George E. Rex, (A. T. & S. F.), said he expected to have tests made on full size stringers 30 ft. long, one half of each stringer to be treated by the vacuum process, and the other half to be left untreated.

In answer to a question as to the steaming of air seasoned Douglas fir, he said that no air seasoned Douglas fir was to be had. Dr. H. Von Schrenk considered this as an initial step, and that many more tests on commercial size timbers were necessary before the subject could be fully understood. This applied particularly to the question of the effect of the heat treatment on the strength of the timber.

THE FOREIGN CREOSOTE OIL SITUATION

By G. A. Lembcke
Lembcke, Von Bermuth Co., New York, N. Y.

During the months immediately following the outbreak of the European war it looked as if all shipments of creosote oil from Europe were definitely and suddenly stopped. The British, as well as the German governments, immediately placed an embargo on the exportation of creosote oil on the ground that they needed it for their own purposes. In Germany, the embargo still exists, while in Great Britain it was found that the fact that the British creosote oil solidifies unless kept at a temperature of about 90 deg. F. made its employment for the purposes originally intended impossible, and the embargo against exportation was consequently withdrawn. Even then, as the British admiralty had commandeered for its own purposes practically all available tank steamers, the question of transportation from the United Kingdom to the United States offered serious difficulties.

As time went on, however, it was found that the tar distillers in Great Britain were called upon by the Government to make deliveries of coal-tar products for the purpose of manufacturing war material. Incidental to supplying this demand, increased quantities of creosote oil were produced and subsequently accumulated in the available storage tanks of the distillers. Thus gradually a situation arose where the distillers' creosote storage needed relief to enable them to meet the government's continued

demands for coal-tar products for ammunition manufacture. Confronted with this situation the British admiralty finally consented to relieve the storage by releasing from time to time, as needed, tank steamers for the purpose of conveying creosote oil from the accumulated stocks of the United Kingdom to the United States. The result was that during the second half of 1915 shipments to this country were made in larger volume than during the early part of the year.

While under present conditions, on account of the censorship and other precautionary regulations in Great Britain, it is more difficult to secure exact records and figures, from the information available and at hand it can be estimated that the shipments of creosote oil from the United Kingdom to this country during 1915 amounted to about 30,000,000 to 35,000,000 U. S. gal. Compared with importations of foreign creosote oils during 1912 of approximately 60,000,000 U. S. gal.; during 1913 of approximately 55,000,000 U. S. gal., and during 1914 of approximately 43,000,000 U. S. gal., the above naturally show a considerable decrease.

It must be considered, however, that this year's total imports excludes all German and Belgian oils, and that the total volume of importations for 1915 consisted of British creosote oil only. Owing to the fact that several of the large railroads decided to abstain for the time being from the use of creosote oil on account of the uncertainty of supplies, as well as to the depressed general conditions in this country, particularly during the early part of 1915, the importations during 1915 sufficed to meet in a measure the somewhat decreased demand.

How the position is going to shape itself during 1916, or even beyond that, of course, remains to be seen and is largely dependent on the duration of the war. If the war should be protracted for another year German and Belgian supplies will not be available for importation. The loss, however, will in all probability be slightly offset by an increased quantity of creosote oil available for shipment in the United Kingdom where as a result of the increased demand for coal-tar products a good many byproduct ovens have replaced the old beehive ovens. It must, however, not be assumed that such possible increase in the production of Great Britain will be sufficiently large to entirely offset the loss caused by the falling off in Continental quantities.

The law of supply and demand suggests that prices for foreign creosote oil in this country will remain about on the present level as long as conditions are as outlined above. Even should the war end sometime during 1916 it is not reasonable to suppose that a decided change in price will take place.

Stocks in Germany are entirely exhausted, and the exportation of creosote oil after the war must of necessity at first at least be slow and reduced in volume. In Great Britain and the other countries involved in this war an immense amount of renewal work must be done after peace is declared, and, therefore, European consumption will be increased while the total amount of creosote oil probably will assume ante-bellum proportions.

WOODS SUITABLE FOR CROSS TIES

By R. Van Metre

The Joyce Watkins Co., Chicago.

A list of the woods suitable for cross ties might fairly embrace, with few exceptions, every species that grows in commercial quantities. One group consists of the woods generally recognized as being sufficiently durable without preservative treatment, and includes the white oaks, black locust, walnut, cherry, sassafras, mulberry, chestnut, cedar, heart longleaf pine and bald cypress. To this list some railroads add all red gum and all red beech. Other roads eliminate certain minor species and include them in the group acceptable for treatment. The other group consists of the woods requiring preservative treatment. This group is worthy of our constant study, for from it will come the future tie supply. In it may be included, with few exceptions, every species that grows in commercial quantities.

In considering the value of any species for a tie, aside from the natural durability and its capacity for treatment, there are three points of importance: That it be sufficiently strong to withstand the ordinary strains due to center binding, etc.; that it be sufficiently dense to resist spike pulling and lateral pressure on spikes; and that it be sufficiently hard to have a proper resistance to rail wear.

It is desirable that some classification of the mechanical suitability of the different species as ties be established from a comparison of their mechanical properties. The Forest Products Laboratory has been working on this, and has suggested the practicability of basing a classification upon a composite figure involving the following mechanical properties:

1. Static bending:
   a. Modulus of rupture.
   b. Fiber stress at elastic limit.
2. Impact bending:
   a. Fiber stress at elastic limit.
3. Compression parallel to grain:
   a. Maximum crushing strength.
   b. Fiber stress at elastic limit.
4. Compression perpendicular to grain:
   a. Fiber stress at elastic limit.
5. Hardness:
   a. End hardness.
   b. Side hardness.

Such a method using the results secured in the many thousands of tests conducted at the Laboratory on small clear specimens, and combining the data on a basis which would seem to give to the different properties a proper and reasonable weight in the composite figure, would result in the following classification of some well known species:

TIMBERS ARRANGED IN ORDER OF THEIR MECHANICAL VALUE AS TIES

No.	Species.	Average Composite Value.
1	Black Locust	1666
2	Sugar Maple	1140
3	White Oak	1050
4	Red Oak	972
5	Beech	955
6	Longleaf Pine	914
7	Red Gum	825
8	Shortleaf Pine	800
9	Western Larch	790
10	Tamarack	740
11	Eastern Hemlock	700
12	White Fur	610
13	Lodgepole Pine	590
14	Western Yellow Pine	560
15	Northern White Cedar	420

In using such a classification, the variability of timber must always be considered since the strength of any given species may vary widely. The figures given are for average forest grown material and individual pieces of any of the species may vary as much as 30 per cent above or below the average.

In addition to the mechanical properties, an important factor in determining the suitability of any species as tie material, is the question of how a wood undergoes seasoning. A few years ago the specifications of many of the roads required that ties be winter cut—between October 1 and March 1—but in most cases this requirement has been eliminated or entirely ignored. I believe if that requirement had been rigidly insisted on, with regard to the so-called softwoods, such truly serviceable woods as beech, gum, the maples, birch and elm, would be standing favorably with the red oak group, instead of having yet to prove their merit. Summer cut ties of these species are subject to the severe checking and deterioration by incipient decay before treatment that winter cut ties escape to a great extent.

The solution of the problem of handling these softwoods is simple in theory, though more difficult in practical operation. It requires two things: a rigid restriction of the cutting period to the months between October 1 and March 1, and the proper piling of ties for seasoning at every stage from the woods to the river bank or right-of-way and to the treating plant yard. Unfavorable results from treated ties made of these woods can usually be traced to failure to observe these precautions.

It is generally conceded that red oak is the very best wood for ties. It is strong, easy to treat, easy to handle to avoid deterioration before treatment and hard to resist rail cutting and spike pulling. For these reasons, all concerned would gladly limit their operations in treatment ties to this wood, if there were sufficient timber available to supply the demand. But the red

oaks for ties are fast going the way of the white oaks. The so-called inferior woods must make up the shortage, and of these, the timber supply and the rate of growth will take care of the demand for many years.

It is not too early to begin to conserve the supply of red oaks for future use in track where the service is severe. This can be accomplished by letting down the bars to other woods on their merits as proved in the test tracks maintained by most large roads. It is only a matter of time when every wood having the requisite mechanical properties will be used for ties. That time will come when the producers and consumers of ties coöperate to control the period of cutting and method of seasoning, so that the ties will reach the treating plant with their natural condition unimpaired by checking and incipient decay.

A verbal report was submitted by the Committee on Preservatives outlining the progress which had been made in co-operating with committees of the American Railway Engineering Association and the American Society for Testing Materials.

Marine Borers and Piling.

Dr. Shackell, of St. Louis University, gave an instructive talk on marine borers from the wood preserver's standpoint, reviewing the results which had been obtained with the creosote treatment, interpreting these results and recommending measures to be adopted. He described tests which had just been completed on piling treated with creosote and with varying fractions of oil and immersed in water infested with wood borers. Some of the piling was sheathed with untreated timber before immersion and some was immersed without sheathing. After six months the unsheathed piling was found untouched, while the sheathing of the other piling was found riddled by borers, which had also entered the treated piling inside. This was explained by the fact that the borer is small when it first enters the wood and is easily killed by toxic oils. Where the sheathing was used, however, the borers had an opportunity to grow while passing through the untreated material and were larger and harder to kill when they reached the treated piling inside. Dr. Shackell urged that piling containing knots be excluded in order to avoid places of lodgment for the borers, and also the use of oil containing not less than 10 per cent tar acids and not less than 25 per cent high boiling constituents above 320 degrees.

REPORT OF COMMITTEE ON SPECIFICATIONS FOR THE PURCHASE AND PRESERVATION OF TREATABLE TIMBER

The purchase of treatable woods is the logical first consideration, since upon the kind and character of the timber purchased largely depends the method of treatment and the ultimate value of the material. For the present this topic is limited to structural timber, track ties, and piling.

Structural Timbers.—The committee recommended the adoption of the following:

a. Restrictions on knots, shakes, checks, and cross grain.—Adopt the specifications which have been adopted during the year by the Southern Pine Association. These specifications should apply to all structural timbers where strength is pre-requisite.

b. Restrictions on density and rate of growth.—Southern yellow pine. Adopt the specifications which have been adopted during the year by the Southern Pine Association. These specifications apply to all Southern pine structural timbers where strength is pre-requisite.

c. Sapwood restrictions.—Since, for a given species, sapwood of equal moisture content and density, is as strong as heartwood, sapwood restrictions need only be considered in relation to the efficiency of treatment. With red oaks, hemlocks, and spruces, for reasons brought out under the discussion on ties, no consideration need be given to sapwood restrictions. With the pines and Douglas fir, however, the amount and distribution of sapwood is of much importance. The following classes listed in the order of their suitability for treatment cover restrictions of this nature:

1. Timbers showing no heart on any face.
2. Timbers showing no sap on any face.
3. Heart face timbers with not less than 80 per cent heartwood.
4. Heart face timbers with not over 20 per cent heartwood.
5. Other timbers not falling in any of the foregoing classes.

d. Other restrictions.—For other restrictions not covered in the foregoing, it was recommended that the specifications of the American Railway Engineering Association, as given on pages 141-144, inclusive, of the 1911 edition of its Manual, be adopted.

Track Ties.—Under this heading are included standard cross ties, bridge ties and switch sets.

a. Mechanical properties.—Since sapwood of like density and moisture content to heartwood, is also of like strength the relative proportion of sap and heart on the same species may be considered from this standpoint. A further consideration is in regard to the effect of decay on the strength. Decay, even when not very noticeable, may greatly reduce the strength value, and hence, with species which decay rapidly, but with short service in the track, may result in a decided weakening. For example, average western yellow pine and white fir might under many conditions of service be reduced in value below the average value given for northern white cedar.

b. Capacity for treatment.—Since it can be stated generally that, with but few exceptions, the sapwood of all species is fairly easy to impregnate, while the heartwood is difficult, the relative proportion of heart and sap is of prime importance. A proper grouping on this basis is very desirable.

c. Other factors.—Aside from the foregoing restrictions and classifications regarding strength and sapwood restrictions, the specifications as to defects, size, etc., as adopted by the American Railway Engineering Association are recommended.

Piles.—The selection and purchase of piles for treatment should take into consideration their ultimate use in salt or fresh water, and for land foundation or marine work, and particularly whether subject to marine borers. The sapwood requirements, especially when the heartwood is resistant to treatment, should be based directly on service considerations. The following sapwood restrictions are based on a classification of the character of service for which the pile is to be used: 1. Piles for use in salt water where ravages of marine borers are extremely severe. Specify not less than 2½ in. of sapwood, nor more than 5 in. 2. Piles for use in salt water where ravages of marine borers are less severe than in Group 1. Specify not less than 1 in. sapwood, nor more than 3 in. 3. Piles for use in fresh water or foundation work on land. No sapwood restrictions are necessary.

Preparing Timber for Treatment

Whenever conditions will permit, thoroughly air season all structural timber, track ties, piles and other material before treatment. So far as practical, arrange the delivery of material so that the seasoning period may be during seasons of minimum railfall and humidity. Pile incoming material in its proper groups or classes, separating green from seasoned or partially seasoned material, and using successive portions of the yard for the storing of green timber. The seasoning yard should be in the open where the prevailing winds will strike it freely; it should not be near any large bodies of water, nor in a low humid location of any kind if it can be avoided; it should have good drainage; and should be kept free from weeds, grass and decaying wood material.

All outer bark should be removed before treatment and in most cases before seasoning. Also as much of the inner bark should be removed as practical, and in no case should over 10 per cent or strips over 1 in. wide and 6 in. long be left.

Practically all woods can be air seasoned except in low, humid locations. Gum is an exception unless air seasoned under favorable conditions. Both gum and beech should be seasoned only in wide open piles and watched very carefully for dry rot. "Bluing" of sap pine during seasoning is not necessarily an indication of decay. Hardwood track ties should be given a minimum of 8

months' seasoning, and should preferably be seasoned 12 months; yellow pine if seasoned in the South, 4 to 6 months; hemlock, tamarack, and jack pine 12 months. Over seasoning may prove detrimental with some species.

A determination of whether wood is sufficiently air seasoned for efficient treatment may be based on a moisture extraction from borings which should show an average of not over 30 per cent moisture in relation to the oven dry weight of the wood; or, if the above moisture determinations cannot be made, season to a constant weight.

When there is not sufficient time for proper air seasoning, or, in the case of piling and large dimension timbers which will not air season successfully throughout without deterioration, artificial seasoning by steaming or boiling before treatment must be resorted to. In steaming the pressure should at no time exceed 20 lb. per sq. in., nor the oil temperature in boiling exceed 200 deg. F., with possible exceptions in the case of some Pacific Coast timbers which may require higher temperatures.

Insist on prompt delivery of all material to the seasoning yard, and on open piles while in the woods or on the right-of-way, the closest piling permissible being 7 by 2. Gum should not be left in the woods nor in close piles over 10 days; treatable hardwoods and sap pine not over 30 days, and heart pine not over 60 days.

Coal Tar Creosote.

From the standpoint of permanence and protection of wood against decay and marine borers, coal tar creosote is the best available preservative for general purposes. It possesses the necessary theoretical requirements, and has stood all practical tests through many years' use under varying conditions of service and in many different kinds of material.

While the carefully drawn specifications of the American Railway Engineering Association and other organizations are desirable and should be followed wherever cost and availability permit, there is no proof that the higher grade creosote oils are necessary when timber is treated to refusal or practically so. The attainment of a high standard and the insistance upon specified fractionation, is the surest protection which the consumer can have in procuring the best quality of oil available. The questions of availability and economy, however, often necessitate a modification of the strictest requirements, and the committee suggests under existing conditions the acceptance of grades 2 and 3 as specified by the American Railway Engineering Association for all general purposes for which grade 1 oil was demanded when available. It naturally follows that the less the injection the better should be the quality of the creosote, from which it is evident that the heavy, high boiling cresotes represented by the German product are preferable for empty cell treatment.

Economical considerations are quite apart from the general acceptance of creosote as the most effective preservative. This leads to methods of reducing the first cost of treatment, and we, therefore, have two general methods of applying creosote to timber as follows:

The full cell treatment under the name of the "Bethell" process is essentially the impregnation of wood with practically all of the creosote it will hold, thereby giving the maximum protection. For many purposes this treatment is too expensive. The committee recommends the use of the full cell process for piling and other marine timbers where subject to attack of the teredo and other marine borers, and that in such situations an injection of at least 20 lb. per sq. ft., or treatment to practical refusal, should be given; while in marine and land situations where decay is the principal source of failure, treatments may range down from 20 to 10 lb. per cu. ft. by the same process, the injection in all cases to be sufficient to penetrate all the sapwood.

We further recommend the full cell treatment in permanent structures not subject to mechanical wear; when conditions of moisture, climate or humidity are favorable to wood destroying fungi, and particularly where the cost of renewals or replacement would be high. To the end that the practice may be standardized we offer the following as a specification:

Specification No. 1.—Full Cell Treatment of Timber

1. *Seasoning.*—Where conditions permit, all ties shall be thoroughly air seasoned; the state of seasoning to be determined by moisture content determinations. The practicable moisture content limits for localities and timbers should be established by experiments. If, for any reason, it is impossible to obtain air seasoned material, artificial seasoning may be used in accordance with practices, as hereinafter specified.

2. *Seasoning by Steam.*—The tie shall be placed in the cylinder and live steam introduced through pipes insuring proper circulation, care being taken to relieve the cylinder of dead air before the pressure is raised. The pressure is then gradually raised to 20 lb., with its corresponding temperature of 258 deg. F., and maintained for such a period as is deemed necessary to properly prepare the timber for the reception of the oil. During the cleaning period, the cylinder shall be kept free from condensation by bleeders properly located.

3. *Vacuum.*—At the expiration of the steaming period the steam shall be blown from the cylinder and a vacuum created of not less than 24 in. and maintained above this point for two hours, steam coils to be run at maximum during vacuum period.

4. *Filling of Cylinder with Preservative.*—Means shall be provided by which the cylinder shall be thoroughly drained of all condensation at the end of the vacuum period, without breaking the vacuum. The oil shall then be introduced into the cylinder, under vacuum, at such a rate as to permit the vacuum pump to maintain a partial vacuum until the filling is complete. The temperature of the oil at time of introduction into cylinder shall be between 170 deg. F. and 190 deg. F., and shall be maintained between these limits during the pressure period.

5. *Pressure.*—The temperature, and intensity, and duration of pressure shall be maintained in such a manner as to secure the greatest possible distribution of penetration, with the specified amount of the preservative. At the expiration of the pressure period, the cylinder shall be drained and the charge left in the cylinder for a sufficient time to prevent the loss of preservative from bleeding. If desired, this period may be shortened by final vacuum.

6. *Thermometer and Gages.*—All tanks and cylinders shall be equipped with thermometers and gages so located as to accurately reflect the conditions during treatment and the quality of the preservative retained by the timber. Proper allowance for expansion and contraction of preservatives shall be made to determine the net quantity used.

7. *Marine Treatment.*—Marine treatment requires a much greater retention of oil and depth of penetration than material not subjected to the action of sea life; therefore, the timber must be subjected to greater preliminary artificial seasoning than that described under full cell treatment.

Empty cell treatment with creosote aims to reduce materially the final retention of creosote per cubic foot, giving at the same time equal depth of penetration. The essential factor entitling any empty cell process to recognition or approval is that there be recovery of usually a minimum of 40 per cent of the oil injected, and that initial penetration before recovery of the surplus be entirely through the treatable portions of the stick; that is, through the sapwood and at least superficially in the heartwood, the extent of the latter depending on the species. It should be remembered that an average of 5 lb. per cu. ft. may mean a retention of 8 to 10 lb. per cu. ft. in the treatable portions where most needed.

The committee finds the empty cell treatment suitable for all pine and other easily treated track ties used in moist climates, under service conditions which give a mechanical life in keeping with the anticipated life for decay; also for structures of limited life or subject to superficial mechanical wear, and elevated so as to be exposed mainly to the wood destroying influence of weather conditions. In all outside situations it is recommended that a maximum injection of creosote, or sufficient to insure the penetration of all treatable wood, be required, and that not

less than an average of 5 lb. of creosote per cu. ft. be left in the treatable portions of the wood; while it is urged, as a definitely specified requirement, that at least all of the sapwood and as much of the heartwood as is possible for the particular species shall be thoroughly impregnated, and the depth or extent of the penetration be equal to that of the full cell treatment.

The following specification for empty cell treatment is submitted:

Specification No. 2.—Empty Cell Treatment of Timber

Seasoning.—Paragraphs 1, 2 and 3 same as in specification No. 1.

3-A.—*Preliminary Air Pressure.*—Where preliminary air pressure is used from 50 to 110 lb. air pressure shall be produced and maintained in the cylinder for at least 30 min. The intensity and duration of this pressure shall be governed by the character of timber being treated.

4. *Filling of Cylinder with Preservatives.*—The maximum air pressure shall be maintained during the filling of the cylinder with preservatives.

5. *Pressure.*—Same as specification No. 1.

5-A. *Final Vacuum.*—In applying final vacuum where the recovery of oil is dependent on the vacuum, it is essential to drain the cylinder quickly and to create a maximum vacuum in a minimum time. Where final vacuum is employed only to assist initial air pressure in the recovery of oil and drying the timber, the intensity and rapidity of the vacuum is not essential.

6. *Thermometers and Gages.*—Same as specification No. 1.

Chloride of Zinc

Chloride of zinc is of great importance as a preservative, and is the only mineral salt extensively used for wood preservation. It deserves full consideration in regions of low precipitation, in dry situations, and where low first cost is essential. While the life of zinc treated material is usually less than that of creosoted, the expense is also less, and the relation of cost to service is an important consideration. Further considerations are an ample domestic supply and ease of transportation. The efficiency of the zinc treatment depends largely on its proper application, and its use under suitable conditions.

We recommend that where zinc chloride alone is used it be by the standard processes known as "Burnettizing" and that a full impregnation which will insure the retention of a minimum of ½ lb. of dry salt per cu. ft. of timber be given. In stating the above minimum standard practice is followed, but the committee suggests that under usual conditions a ¾ lb. injection would be advisable.

We suggest zinc chloride treatment in arid and semi-arid regions, particularly for track ties and other material with mechanical life limited to the expectation of life from decay and checking; also for woods resistent to creosote. It should not be used where mechanical wear is eliminated, nor in situations where the treated timber is in permanent or intermittent contact with either stagnant or flowing water. Consideration should also be given to its use on overhead trestles and similar structures.

Under usual conditions three months' seasoning after treatment is advisable.

Creosote-Zinc Chloride

The use of creosote and zinc chloride in mixture has been practiced for some years, both in this country and in Europe, although the Rutger process is now practically abandoned abroad in favor of straight creosote treatment.

While evidence is at hand to indicate satisfactory service from timber treated by a combination of zinc chloride and creosote, the question has arisen as to the conditions under which the best results in economy and service will be obtained by proper treatment with straight zinc chloride, creosote-zinc chloride, or by a light empty cell treatment with creosote. In the absence of conclusive data the effect of creosoting as a seal, and of the coating or penetrative action of emulsified oil should be further investigated. The action of creosote in preventing checking within reasonable limits is recognized, but its waterproofing influence should be further investigated. The creosote-zinc chloride mixture is fundamentally effective, because composed of the two most widely accepted preservatives.

E. A. Sterling, Consulting Timber Engineer, Chicago, chairman; Carl G. Crawford, American Creosoting Co., Louisville, Ky.; C. P. Winslow, Forest Products Laboratory, Madison, Wis.; Wm. A. Fisher, A. C. L., Wilmington, N. C.; Lowry Smith, N. P., Brainerd, Minn.; Geo. E. Rex. A. T. & S. F., Topeka, Kan.; O. P. M. Goss, Consulting Engineer, Seattle, Wash.; J. B. Card, Chicago Creosoting Co., Chicago, Ill., committee.

Dr. Hermann Von Schrenk made an address, which he illustrated with stereopticon views, on the relation of fungi to treated and untreated wood. The timber must be adapted to the intended service before being treated. Failures of treated material generally result from well defined causes, the three most important of which are quality of material treated, character of treating material used, and method of treatment. A specific study should be made of decay losses at each specific tie yard, for conditions vary widely at different points. Sources of decay should be removed and good drainage afforded at all yards. Dr. Von Schrenk showed numerous specimens of reported creosoted timber failures where the failures proved to be in untreated portions of the woods. He requires all treated ties which are removed from tracks on roads with which he is connected to be held for examination.

TREATED WOOD BLOCKS FOR FACTORY FLOORING AND MISCELLANEOUS USES

This subject was covered from the standpoint of railroad buildings in an article in the *Railway Age Gazette* for December 17, 1915, page 1145. A paper on this subject by C. H. Teesdale, Forest Products Laboratory, Madison, Wis., contains further information, based largely on data obtained as a result of inquiries sent to manufacturers and users of this material. It is abstracted in brief below.

Letters were written to plants manufacturing creosoted wood blocks requesting data on their methods, and reports were received from 13 commercial plants and one railroad plant. Several of the plants, particularly those producing the largest quantities of this material, pointed out that the wood block flooring problem naturally divides itself into two classes: those used in very dry situations, as in factories and warehouses, and those used in alternately wet and dry, or in wet situations, where the blocks are exposed to the weather, to flushing with water, etc. The treatment and method of handling the blocks differs radically in the two cases. Eight of the 14 plants reported in favor of using a distillate creosote oil, three plants recommended paving oil similar to that in use for wood block street paving and four recommended various other oils or mixtures. The concensus of opinion was in favor of a distillate creosote, especially for dry situations, and a heavier paving oil for wet conditions.

It is evident that the use to which the blocks would be put has a very important bearing on whether the timber should be thoroughly dried out before treatment. Three producers pointed out that blocks which are to be used in inside construction heated in winter and kept dry should be thoroughly air dried or kiln dried before treatment; otherwise, if they are comparatively wet when laid they are liable to shrink badly in the floor and become loose. However, if the blocks are to be subject to alternate wet and dry conditions, swelling and heaving are liable to take place if they are too dry when laid. All but one of the plants reporting on blocks for inside construction prefer air-dry material. The majority also prefer air-dry material for blocks in wet situations.

Of 12 plants 7 stated that the timber should not be steamed before treatment, and one not if the timber is dry. The concensus of opinion, especially in the case of those plants producing the larger amounts of flooring, was not to steam the timber.

Letters were written to a large number of users of wood block flooring, to obtain information on the character of the floors being laid and the results obtained and 160 replies were received,

which indicate the comparatively recent development of this type of flooring. The depth of block used varied from 2 to 6 in., but 3 in. was used in 56 per cent of the floors. Southern yellow pine was used in 72 per cent of the cases.

A concrete foundation was reported in 80 per cent of the replies, the remainder being plank, dirt, tamped earth, etc. Seventy-one per cent reported the use of a sand cushion, 12 per cent a cement grout cushion, and 3 per cent bituminous cushions. Bituminous fillers were reported by 44 per cent, and sand by 25 per cent. Thirty-nine per cent reported that expansion joints were used, while 41 per cent did not use them. Summing up, the general practice was to use 3-in. Southern yellow pine blocks treated with 15 lb. or more of creosote per cubic foot by the Bethell process. These were laid with a concrete foundation, sand cushion, bituminous filler, and the question of using expansion joints depended on the local conditions in each case.

Repairs have been reported in 32 per cent of the records, while 62 per cent reported no repairs. In most cases the repairs made were of a minor character, and as a rule, were caused by swelling or shrinking of the wood. In a few cases blocks were badly worn where heavy castings were thrown upon them.

Bleeding of the blocks was reported in 9 per cent of the records, but was said to be objectionable in only 2.5 per cent of the cases. Swelling was reported in 29 per cent and shrinking in 27 per cent of the records (in some cases both swelling and shrinking were reported), and these troubles were the cause of most of the dissatisfaction reported. Swelling occurred when the blocks became wet accidentally. Shrinking occurred in very warm or hot situations.

An interesting relation may be shown between the kind of filler used and the swelling and shrinking reported. Thirty-three per cent of those using bituminous filler reported this trouble, compared with 55 per cent of those using a sand filler, 75 per cent where cement grout was used, and 55 per cent where no filler was used.

Eighty-nine per cent replied that the blocks were satisfactory, while 5.6 per cent did not reply to the question, and 5.6 per cent, or nine records, stated that the flooring was not satisfactory. Of the nine unsatisfactory floors, shrinkage of the blocks was responsible for dissatisfaction in three cases, swelling in two cases, in two cases the blocks wore out rapidly, poor foundation in one case and improper laying in one case.

The results of this investigation indicate that treated wood block makes a desirable type of flooring for many purposes, and it is likely that its use for interior work will increase. Since its large use for these purposes is just beginning, one might expect that unforseen trouble would develop. The records of 160 floors given in this report indicate, however, that serious trouble has developed in a very low percentage of cases. In a few instances it seems likely that wood blocks should not be used. For example, they should not be used where butter or tobacco products are stored. In some foundries, where hot castings are thrown upon the floor, the blocks have burned through to the foundation. Wood blocks may also be objectionable where the soiling or staining of certain classes of merchandise would lower the value.

REPORT OF COMMITTEE ON SERVICE TESTS OF CROSS TIES

The committee presented a report consisting of (1) a compilation of durability records of treated and untreated ties involving data on over 50 species and including over 1,200 individual records, and (2) a series of tabulations summariizng the more important and apparently effective records presented in this compilation.

Of the total of 287 records of untreated ties, 200, or approximately 66 per cent, are supplied by 6 railroads. Seventy-nine records are from the C. B. & Q.; 34 from the I. C.; 27 from the G. H. & S. A., and the remainder from the C. M. & St. P. and the G. C. & S. F. Of the completed records, the longest life reported in the United States is 12 to 13 years for 1,185 juniper ties in the tracks of the Norfolk Southern; the shortest record is approximately 2.5 years for 83 gum ties in the tracks of the G. H. & S. A.

The tabulation of the empty cell creosote treatment includes records on ties treated respectively by the Rueping and Lowry processes. Of the total of 54 records of ties treated by the Rueping process none are yet completed. All of the records are covered by seven railroads, the I. C. and the A. T. & S. F. furnishing most of them. The longest service so far reported is no removals of 146 pine ties after 9½ years in the Mexican Central. The remaining records are on ties which have been in place from one to 11 years. The removals vary from nothing up to about 9 per cent. Of ties treated by the Lowry process, the total available effective records are six, located in the tracks of the Big Four and the Lackawanna. The only record completed, shows an average life of 10 years for oak ties in the tracks of the Big Four with the added information that none were removed on accunot of rot. The remaining five records involve ties which have been in the tracks of the D. L. & W for 1 to 5 years, with no removals reported so far.

Of a total of 162 records of Bethell and full cell creosote treatments supplied by 31 railroads, 147 records from 29 railroads are unfinished. Of the completed records, the best service reported in this country is an average life of 20 years for 400 hemlock ties laid in 1880 in the tracks of the N. Y., N. H. & H., with removals reported as due to rail-cutting and not to rot. The shortest service record is that of complete removal of 20,000 yellow pine ties from the tracks of the D. L. & W., in 7 to 9 years, with the added information that many of them were killed by steaming during treatment, and removals are caused largely by crushing under the tie plates. With the unfinished records, some of the ties have been in service as long as 23 years, while others have been installed for only 1 or 2 years.

But six records of open tank creosote treatments, none of which are completed, are available. The best service so far reported is no removals of 29 pine ties after 9½ years in the tracks of the Mexican Central Railway.

There are 183 records of straight zinc chloride treatment, of which 142 are at present uncompleted. The maximum life so far reported shows approximately 10.7 years for 3,080 red oak ties in the tracks of the I. C., and from 9 to 11.3 years for many thousands of Douglas fir ties in the tracks of the S. P. The minimum life reported is complete removal at 3 years of 8 redwood ties in the tracks of the G. C. & S. F., and similar results at 5½ years with 1,000 sap pines in the tracks of the G. H. & S. A., and an average life of 5 to 6 years in the tracks of the Wabash.

Combination zinc and creosote treatments are considered in two divisions, those treated by the Card process, and those treated by the Allardyce and other methods of combination. Of the Card treatment there are available a total of 93 records, 92 of which are still unfinished. The one completed record shows a life of 5 years for 49 hemlock ties in the tracks of the G. C. & S. F. Of the unfinished records, the best results reported show after 7 years no removals of 596 hard maple ties in the tracks of the C. M. & St. P., while the poorest results reported show 67 per cent removals on account of rail cutting of 160 loblolly pine ties after 6 years in the tracks of the C. B. & Q., and 90 per cent removals of 51 tamarack ties after 10 years in the tracks of the G. C. & S. F. Of the Allardyce and other combination treatments, there are a total of 32 records, 24 of which are unfinished. Of the completed records, the maximum life as reported is an average of 14 to 18 years for about 1,800 pine ties in the tracks of the G. H. & S. A. The minimum life is given as 100 per cent removal of a few turkey oak ties after 3 years in the G. C. & S. F. Of the unfinished records, the best report is that of 41 Douglas fir, with only 5 per cent removals in 8½ years in the tracks of the C. B. & Q.

In order to round out and complete the data at present available, additional records are needed concerning the following:

1. Untreated ties of beech, birch, maple, gum, eastern and western hemlock, western larch and the various pines. These are species largely used for ties, and for which there are very little available durability data.

2. Untreated ties of Pinon pine, white fir, Alpine fir, red fir, (*Manifica*) and Engleman spruce. These are species occurring in the West and Northwest, and offering the possibility of an increased use in the future.

3. Ties treated by the Lowry process and to somewhat less extent, by the Rueping process. Available records of these two processes are much fewer than with the other processes.

C. P. Winslow, Forest Products Laboratory, Madison Wis., chairman; L. T. Ericson, American Creosoting Co., New York; C. F. Ford, C. R. I. & P., Chicago; C. E. Gosline, D. L. & W., Boonton, N. J.; F. D. Mattos, S. P., Oakland, Cal.; Geo. L. Pollock, C. & W. I., Chicago; F. S. Pooler, C. M. & St. P., Chicago, committee.

REPORT OF COMMITTEE ON SERVICE TESTS OF BRIDGE AND STRUCTURAL TIMBER

A report was presented on Service Tests of Bridge and Structural Timber, consisting principally of the specifications for creosoted timber and piling of the Norfolk & Western and of the Illinois Central and a record of treated bridge and structural timber compiled by the Norfolk & Western, which record is given herewith. The report also contained some information concerning the extent of the treatment of structural timber on the Illinois Central from which it is noted that about 96,000,000 ft. board measure (half timber and half piling) had been treated and in service for a maximum period of 13 years. A small amount is intended merely to make the sap last as long as the heart timber and the results secured have been satisfactory. This road has also just begun treating all bridge material for open deck trestles with zinc chloride. The report is signed by H. M. Rollins, Gulfport Creosoting Company, Gulfport, Miss., chairman; E. Stimson, engineer maintenance of way, Baltimore & Ohio, Baltimore, and H. E. Horrocks, Pacific Creosoting Company, Seattle, Wash.

OTHER PAPERS

A paper was also presented by W. F. Goltra entitled, The Quantity of Zinc Chloride Per Tie or Per Cubic Foot of Timber, and the Method of Determining the True Strength of the Solution. This paper was published in abstract in the *Railway Age Gazette* of March 12, 1915, page 459. A paper was also presented on Selecting and Buying Fuel, by W. H. Grady, and another on Present Practice of Municipalities in Treating and Installing Wood Block Pavements, by Frank W. Cherryington, the Jennison Wright Company, Toledo, Ohio. The committee on Wood Block Paving presented specifications for creosoted wood block paving for use as street pavement, and the Committee on Specifications for Preservative for Wood Paving Blocks presented a specification for paving oil.

Members and guests to the number of 125 attended the annual banquet at the Hotel Sherman on Wednesday evening. Professor F. H. Newell of the University of Illinois was the speaker of the evening, his subject being conservation work in the west, including federal irrigation developments.

The following officers were elected on Thursday morning: President, Carl Crawford, general manager, American Creosoting Company, Louisville, Ky.; first vice-president, John Foley, forester, Pennsylvania Railroad, Philadelphia, Pa.; second vice-president, Morris K. Trumbull, vice-president, National Lumber & Creosoting Company, Kansas City, Mo.; secretary-treasurer, F. J. Angier, superintendent timber preservation, Baltimore & Ohio, Baltimore, Md. Members executive committee: A. R. Joyce, The Joyce Walhens Company, Chicago, and F. S. Pooler, tie agent, Chicago, Milwaukee & St. Paul, Chicago.

RECORD OF TREATED BRIDGE AND STRUCTURAL TIMBER.

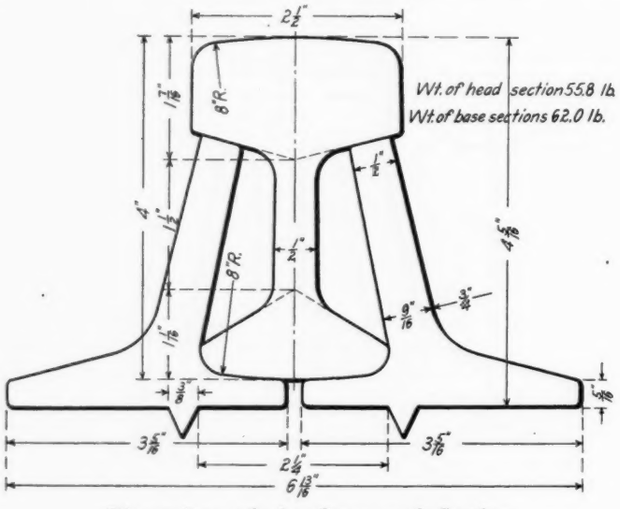
Location	Kind Of Timber	Species	Process	Preservative	Pounds Per Cu. Ft.	Date Placed	REMARKS:
Southern Ry.	Ballast deck bridges	Pine	Full Cell	Cresote	16	1905	Still in use.
" "	Tank frames & highway bridges	"	" "	"	16	Since 1909	Still in use.
Seaboard Air Line	Piling	Loblolly	" "	"	24	1903	Still good except a few removed on account of teredo entering where loose knots were developed; untreated piles are destroyed at the Manatee river in from 1 to 2 years.
" " "	Trestle	Pine	" "	"	16	1909	Still in use. All material treated according to A. R. E. A. specifications.
Lehigh Valley	Newark Bay trestle	Bull Pine	" "	"	Caps 10 Piling, 12	1890	Still in good condition, 1938 piling put into structure. Still in good condition, 1938 caps put into structure.
" " Jersey City	Pier No. 8	Yellow Pine	" "	"	Piling, 10 Timbers, 8	1890	Still in good condition
Lehigh Valley	South Fort Wharf Perth Amboy		" "	"	Piling, 10	1888	Still in good condition. This material in the coal dumper pier.
Lehigh Valley	Highway bridge			"		About 1890	Still in good condition. This is bridge No. 43 East of Mechanic, N. J.
" "	Coal Dock "A" Perth Amboy			"	Piling, 12 Timbers, 10	1886	Still in good condition.
Norfolk & Western	Piling	Va. Pine	Full Cell	"	12		Decay at top account teredo entering where creosote protection was defective.
" " "	Sheet piling	Pine	" "	"	12		Cause for removal, decay. Average life for piling { 15 to 24 years / 8 to 12 years
" " "	Framing for docks and fenders	N. C. Pine	" "	"	12		Draw bridge fenders removed account mechanical wear.
" " "	Floor joists	" " "	" "	"	8		
D. L. & W.	Guard rails Bergen tunnel	Yellow Pine	" "	"	12	1908	Still in service.
" " " "	Bridges	" "	" "	"	12	1908	Still in service.
War Department U. S. Engineer Office, New Orleans, La.	Piling & Timbers	L. L. Yellow Pine	" "	"	Piling, 20 Timbers, 14	About 1907	Piling and timbers in coal dock in good condition. Piling and timbers in other structures, varying in age 1 to 6 years, all in good condition. Derrick timbers creosoted as shown lasted 7 years, rotted at base and at splice, due to accumulated moisture and wearing away of edges at base, exposing interior of timber.
Sunset-Central Lines	Signal poles	Yellow Pine	" "	"	10 & 20	1904-1910	3 or 4 poles out of 17,927 put in use between the years 1904 and 1910 broke off in high winds at the ground line, and showed decay at that point.

THE LONG ISLAND TRACK INSPECTION

The annual track inspection of the Long Island was made on October 20 and 21 by three officials traveling in one of the Pennsylvania track inspection cars. Approximately 538 miles of track was rated for line, surface, ballast line and general neatness, each section being marked separately on the basis of 10 as perfect. The first prize of $200 was awarded to Coleman King, supervisor of subdivision No. 2, and the second prize of $100 to Frank E. Turner, supervisor of subdivision No. 4. A prize of $100 was also awarded to K. M. Hamman, supervisor of division No. 5 for the greatest improvement made in a subdivision. In addition a first prize of $100 and a second prize of $50 were awarded to the section foreman on each supervisor's subdivision having the first and second best sections.

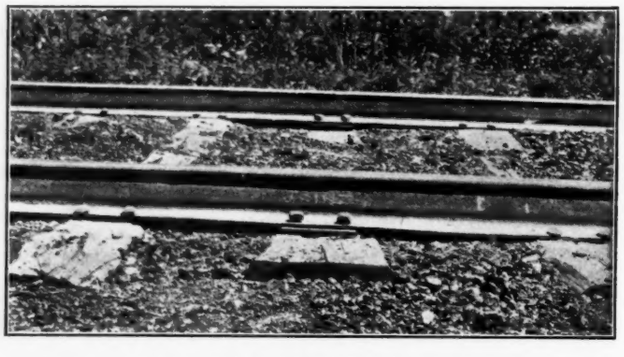
A NOVEL RAIL SECTION

A marked departure from the commonly accepted designs of rails is seen in a rail now in use in 40 ft. of track on the main line of the Minneapolis, St. Paul & Sault Ste. Marie near Minneapolis, Minn. The rail is made up of three separately-rolled



Dimensions of the Compound Section

members, as shown in the accompanying cross section. The central portion, shaped like the English bullhead rail, is enclosed except the head, by two T-shaped supporting sections, the three pieces being of such proportions that the central part is supported on the underside of the head and also on the base. Holes are provided in the outstanding legs of the supporting sections



The Rail in Track

for spiking or bolting the rail to the ties. No other fastenings are used either to hold the three portions together or to splice the joints. One advantage claimed for this rail is that by staggering the joints in the center or tread section with reference to those in the supporting sections, no splices of any kind are required. Another advantage suggested is that the portion subject to wear comprises only one-half the weight of the composite section and can be renewed independently of the supporting portions which are not subject to wear.

The rails in use on the "Soo" were installed in November, 1914, and consist for each rail of a 20-ft. length of head section in the center with a 10-ft. length on either end, supported on two 20-ft. lengths of base sections, thus breaking the joints. A special compromise joint was provided for the connection to the standard rail on either end. Owing to the small amount of this rail used it was not rolled, but was planed out of solid material, a bloom serving as a blank for the head section, while an I-beam served the same purpose for the base section. The track has been inspected frequently, but the length of service has been too short to demonstrate the true merits of the new section. Future developments will be watched with interest. The rails were furnished by the American Safety Steel Rail Company, Bismark, N. D.

SIMPLE MEASURES BY WHICH A ROADMASTER CAN PROMOTE EFFICIENCY

By A. W. Tabert
Roadmaster, Chicago & North Western, Allis, Wis.

A roadmaster can promote the efficiency of his forces by obtaining the very best men possible for foremen and at all times selecting the best men from among his labor forces to fill any vacancies that may occur. By so doing he will encourage the men to stay with their work, as they may look forward for promotion. He should study closely the character of his foremen, to know best how to handle them, as all men cannot be handled in the same manner.

He must make each man proud of his position and let him know that he is the representative of the company on his respective section. Make him feel that he is not merely to look after the low joints in the track, but that the railway's interests are just as much cared for by keeping stock off the right of way. He should also see that the ditches do not wash cinders on the farmers' pastures. Impress upon the men the importance of meeting the farmer along the right of way in a friendly manner. In this way they will be led to see the farmer's as well as the company's side of any controversy, and many little irritating things will never be brought against the company.

Trackmen are a hard working, conscientious body of men, at all times anxious to learn, but with the many new appliances now in use, concerning which the trackmen have received little or no instruction, high efficiency cannot be expected. I have seen track appliances improperly installed many times, resulting in a short life for the devices and a loss of the benefits desired from the money invested. The section foremen should receive proper instruction as to the method of performing certain work, also as to the use of tools, as good tools are expensive and will last for years if given reasonable care. Instructions should also be given to foremen concerning the construction and maintenance of frogs, switches and all track appliances so that they may know how to make correctly minor repairs on the ground, which will not only save the cost of handling the material and shop expense, but will materially add to their life.

The foremen should be trained to work according to a prescribed system, and in such a way as to take advantage of the different seasons of the year. It is a good plan to get the foremen as deeply interested in their work as possible in order that they may look after it as though it were their own enterprise.

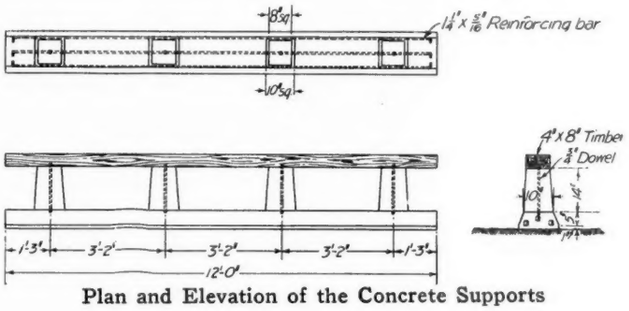
To promote efficiency and specialization a roadmaster should know each foreman as he does each bad spot in the track. He should know how much he can do alone, and try and give him what he is lacking. Encourage him to experiment with a piece of track that needs drainage, and be able to give him expert advice.

CONCRETE SUPPORTS FOR LUMBER PILES

By MacRae D. Campbell

Some one has said that "rot comes between wind and water." Extremes of wetness and dryness both prevent rot. Rot is a disease caused by fungi which are spread chiefly by direct contact, but living spores carried in the air can take root when they find a favorable resting place. Fungi are frequently carried in lumber and spread by placing it in large piles with scant ventilation. As a result of this, bridge timbers and ties piled without proper ventilation are often found more deeply infected in the middle than at the ends.

The separation of lumber in piles by the use of sticks containing living fungus is another cause of infection. Timber placed on rotten supports near the earth quickly becomes dis-



Plan and Elevation of the Concrete Supports

eased, or if the supports are not rotten at the time when placed, the varying dry-and-moist conditions of the timber support lying on the soil soon contribute to the development of fungi, which in turn will be communicated to the piled lumber.

Prevention of this is in a measure secured in a number of large lumber yards by using concrete supports for lumber piles. The accompanying photograph and drawing illustrate one type of such support now in general use in a large yard in Toronto, Ontario. As most railroads have storage yards where valuable bridge timbers, for instance, are held in storage, it would seem an economical procedure for them to provide concrete supports

Concrete Supports Ready for Use in Lumber Yard

such as illustrated. These are portable units. The reinforced beam may be made separate from the pedestals upon which the 4 in. by 8 in. stringer is placed and upon which the lumber rests.

Reinforcing in this particular design consists of 1¼-in. by 5/16-in. steel bars placed as shown in the sketch representing a sectional elevation. Pedestals are cast with a ¾-in. steel dowel pin through their center, this pin projecting above and below the top and base a sufficient distance to permit engaging with the beam and with the 4 in. by 8 in. stringer, both of which have holes sunk in their faces to receive the extension of the dowels.

Considering the fact that this construction represents permanence, and that the supports may be made of several separate units (in this case 5, where the length of the beam is 12 ft.), it would seem that railroads could profitably manufacture these supports and would find them eventually a very economical adjunct to storage yards where large quantities of valuable bridge timbers are stored awaiting ultimate use.

For work of this kind, the concrete mixture commonly employed in fence post manufacture would be appropriate. Particular care should be taken to protect the finished concrete until it has had a chance to thoroughly cure, this being accomplished by protecting them with a covering of wet straw that should be kept wet for a week or ten days, under ordinary weather conditions, and after removal, allowing the concrete to further cure under natural conditions until 30 days old before being subjected to its ultimate use. Steam curing would be still better where such facilities are available.

THE FUTURE OF THE SECTION FOREMAN

By W. H. Edwards

Denver & Salt Lake, Fraser, Colo.

Everyone conversant with modern track conditions must admit that there must be a change before long concerning the section foreman. The change must be made primarily to better the conditions which surround him, but the improvement will be of benefit to the roads as well. Two things militate against the continued existence of the section foreman as he now is, and the maintenance of the efficiency of the permanent way organization of the American railroads; inadequate wages compared with the importance of the work and the popular idea of the inferiority of the position.

The first condition probably cannot be overcome for some time to come, but it will have to be met, as better days are coming for the railroads. There is no excuse for allowing the second condition to prevail, as it is entirely false and unjust both to the men and the railroads. Of these two fundamental conditions that exist to-day, I believe the second is the most injurious to the future of the first-class section foreman. It is important that every man concerned—supervisor, roadmaster, division engineer, superintendent, president and general manager—start a campaign to eliminate this unjust but prevalent idea, and to raise the position to its rightful place—among the most responsible and skilled of higher labor in the railroad world. When this is done and the position receives its just share of honor and respect, we will see the track department gradually filling with clear-eyed, responsible, ambitious young men, taking the places made vacant by that fast-disappearing army of capable, efficient and competent trackmen of the old school. The increasing demands of modern track under fast, heavy traffic call for men of a higher stamp than the present type of foreigner, who is entering this department to-day. If the two conditions cited above are not taken care of before long, the railroads will inevitably be forced to face the three conditions below at no far future time. The present remaining responsible trackmen will organize into a powerful union and present their demands to the railroads for an uplift in conditions. The railroads will be forced to educate young men at their own expense in technical schools to fit them to enter this department. They will also have to employ an inferior class of foreigners for this department.

It is needless to say the first condition will be a hard one for the roads to meet, as they can amply testify by past experiences with labor organizations. Why allow this condition to come to a head in the future when a little assistance given the trackmen now to help them solve their troubles will eliminate or at least, stave it off for years? If the trackmen are forced to solve their own problem, this will undoubtedly be the solution.

Passing by the first condition and its solution, if the railroads

also have to meet the second, they will find it expensive, as it costs money to give a young man a technical education, and on the other hand, a young man with ambition enough to take a technical course, is not going to select one covering a course with as slight a future as the track department presents to-day. The wages, the conditions and the future of the work must be raised to induce the young man to consider taking the course to fit himself for the job.

As to the third condition, it can practically be eliminated, as not enough men can be found among the present class of foreigners with the necessary education to fill all the positions on all the roads, and there is one trait of the foreigner which should eliminate him (except the foreigner of the very highest stamp) from positions of responsibility in railroading. This is the cheapness of human life as regarded by him. This weakness is well known by practical railroad men whose duties bring them in contact with these men. Enginemen and trainmen can testify to numerous cases where foreign laborers have renewed rails without protecting traffic, and have just escaped disaster in other cases owing entirely to the efficient vigilance of an American employee. It is hard to find a roadmaster who is willing to trust a foreign foreman with any job that will obstruct the track, unless he has a competent American foreman close by who realizes the responsibility of fully protecting the company's property and human life. I have often had to pump a hand car against the wind for 14 to 18 miles under the orders of a roadmaster or division engineer to put in a new rail on a section governed by a Mexican or Italian foreman, as the officials would not trust them to the job on account of their indifference in flagging against trains. The only reason the foreigner makes any attempt to protect traffic against disaster is that he has learned that if he causes an accident he is likely to be discharged. Is this a safe man to rely upon getting up out of his warm bed in the middle of the night in a terrific cloudburst, and guarding his bridges and fills to keep a heavily-loaded passenger train from plunging to destruction? He certainly is not. It has only been two or three years since a fast passenger train rounded a curve at 60 miles an hour on a western road where a Japanese section foreman and his crew had two rails up without the slightest protection out against trains, notwithstanding the fact that they knew they were working on the time of this passenger train. This wreck cost several lives and the company half a million dollars.

The section foreman should be relieved of much of the work he has to do at present, by installing "extra work" gangs covering four or more sections and taking care of all fence repairs, road crossings, weed cutting, assisting the heavier sections in tie renewals and helping take care of all the other departments' work which now falls to the section foreman to keep up beside his own. It is not uncommon for the foremen on some of the heavier sections to spend 75 per cent of their time and energy in work for other departments, that in no wise pertains to the upkeep of their track, and being forced to maintain their track in running condition during the remaining 25 per cent of their time. The section foreman is an important man and it behooves the railroads to recognize him fully that he may stay with them and keep up with the efficiency call of modern track conditions.

AN UNUSUAL RECORD FOR A MOTOR CAR

The unusual service secured from a Buda motor car by a representative of the Railway Educational Bureau, Omaha, Neb., was described in the issue of March 16, 1915, page 517. Up to March 8 this car had traveled 17,500 miles. This car had then traveled over the entire Illinois Central System, over all Union Pacific lines east and south of Cheyenne, over the St. Joe & Grand Island, and over about one-third of the Frisco System, without any delay because of trouble with the car. Since that time it traveled 10,000 miles additional previous to May, 1915, at which time it was in the vicinity of the shops of the Buda Company, at Harvey, Ill., and opportunity was taken to give it a thorough examination. On taking the car apart it was found that the only repairs necessary were the removal of a couple of shims from the connecting rod bearings and the cleaning of the carbon from the pistons and cylinder. The car was returned to service on May 14 without any further repairs, and between May 14 and December 31 ran approximately 14,104 miles additional without any trouble. On leaving Chicago the car covered the main lines of the Illinois Central, the Union Pacific, the Oregon Short Line and the Oregon-Washington Railroad & Navigation Company between Chicago and Portland, Ore., from which latter point it was shipped by boat to Los Angeles, and is now returning over the San Pedro, Los Angeles & Salt Lake.

WATERPROOFING CONCRETE SURFACES*

J. L. Lytel, project manager of the Strawberry valley project, Utah, records an interesting experience in waterproofing concrete surfaces. The storage works and tunnel of the Strawberry valley project are located in the Wasatch mountains at an elevation of 7,500 ft. There is a wide variation in temperatures in this vicinity and the climate is very severe during the winter months, the lowest temperature on record being 50 deg. below zero. The snow fall ranges from 10 to 24 ft. in depth.

The extreme cold, with alternate thawing and freezing of water in the pores of the exposed faces of the structures, was found to have a very destructive effect on these concrete structures and the waterproofing of the surfaces was decided upon as a preventive against their continued disintegration.

It was decided to treat the vertical surfaces with alum and soap solutions and the horizontal surface with paraffine. The alum solution was made by dissolving 2 oz. of alum in 1 gal. of hot water. The soap solution was composed of ¾ lb. of castile soap dissolved in 1 gal. of hot water. The paraffine was boiled to drive off water as the presence of water rendered it hard to apply. Ordinary commercial products were used.

The surface to be treated with paraffine was first thoroughly dried and cleaned of loose concrete, dirt, and other foreign substances. The paraffine was then heated and applied with a paint brush, and was forced into the pores by the heat of a blow torch on the surface. Only one coat of paraffine was applied, as the concrete would not absorb more.

The surface to be treated with soap and alum was prepared as above stated. The alum solution was applied at a temperature of 100 deg. F. with a moderately stiff brush and was then worked in with a stiff horse brush. While the surface was still moist from this treatment the hot soap solution was applied in the same manner as the alum solution. One treatment by each solution in the manner described above constituted a coat. If other coats were considered necessary, they were applied in like manner after the preceding coat had been allowed to stand 24 hours or more.

Twelve structures were given this treatment, the surface area covered being approximately 28,000 sq. ft. Four thousand sq. ft. were treated with paraffine, at the rate of 1 lb. for 11¾ sq. ft., and the remainder with soap and alum. It required 1 gal. of alum solution and a half gallon of soap solution to cover 50 sq. ft. with two coats. Two coats of alum and soap were applied at an average total cost of 75 cents per 100 sq. ft., and the cost varied from 41 cents minimum to $1.28 maximum. The cost of one coat of paraffine varied from $1.70 to $3.78 per 100 sq. ft., and averaged $2.11. This cost covers everything except general expense. The two men who did this work received $75 and $80 a month. Brushes cost $6.06, castile soap 12½ cents a lb., alum 18 cents a lb., and crude paraffine $4.80 a hundredweight.

The results obtained by this style of waterproofing are considered very satisfactory. The structures that were repaired and treated have gone through two severe winters and no further disintegration of the concrete on any part has occurred.

*From the Reclamation Record, April, 1915.

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EDITORS:
SAMUEL O. DUNN, *Editor*
ROY V. WRIGHT, *Managing Editor.*

W. E. HOOPER	H. H. SIMMONS	A. C. LOUDON	C. W. FOSS
B. B. ADAMS	H. F. LANE	C. B. PECK	F. W. KRAEGER
E. T. HOWSON	R. E. THAYER	W. S. LACHER	G. L. LACHER
	K. R. HARE		

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General News Department

William J. Cunningham, president's assistant of the Boston & Maine, and assistant professor of transportation in the Harvard School of Business Administration, has been promoted to professor of transportation.

The Chicago & Eastern Illinois freight and passenger station at Mt. Vernon, Ind., was destroyed by fire on January 11.

In the Federal court at Knoxville, Tenn., January 13, the Southern Railway was fined for two violations of the safety appliance law, and the Cincinnati, New Orleans & Texas Pacific for one violation.

The Transportation Club, of Louisville, will hold its annual dinner at the Seelbach Hotel, Louisville, Ky., on February 2. The principal speaker will be Blewett Lee, general solicitor of the Illinois Central, whose subject will be "What Next in Regulating Railroads?"

Representatives of the railroad labor unions have asked the governor of New York to appoint "practical railroad men" to vacancies soon to occur in the Public Service Commission of the state; and they have recommended C. A. Burr, an attorney, of New York City, formerly a conductor, and William C. Gurney, of Binghamton.

It appears that the law passed by the last legislature of Tennessee, called the anti-tipping law, applying specifically to railroads, dining cars, and Pullman cars, is now in force. This law was enacted in the same manner as that abolishing capital punishment; and both were vetoed by the governor. The capital punishment law was taken to the Supreme Court of the state and it was there ruled that the veto was of no effect, having been sent two or three days too late. Now, by the court's decision, the anti-tipping law veto is nullified, the same as the other, and "tipping" becomes unlawful. Railroads are required to post the law in stations and on all trains within the state of Tennessee.

Lehigh Valley Track Inspection Results

According to the report of a committee of 40 experts who recently made the annual track inspection over the Lehigh Valley the best section is that on the main line at North Spencer, N. Y., and the best division the New York division. The awards were made on a percentage basis, regard being given to surface, line, ties, anti-creepers, ballast, drainage, general appearance, etc. Section 55, at North Spencer, received 97.42 per cent.; Section 41 at Millgrove, N. Y., 97.10 per cent., and Section 40 at Longwood, N. Y., 97.06 per cent. John Nash is supervisor of the winning section.

The New York division as a whole received 96.97 per cent, the best section being at Oak Island which received 97.04 per cent. The New Jersey & Lehigh division was second with 94.98 per cent, while the Buffalo division was third with 97.04 per cent. An interesting feature of the report is the fact that the entire line itself received a percentage of 95.13.

In a Nutshell

The Committee on Railway Mail Pay, Ralph Peters, New York, Chairman, has issued a pamphlet showing the receipts and expenditures of the post office department in tabular form, as follows:

	1900	1915	Increase
Receipts			
Total Revenues	$102,354,579	$287,248,165	181 per cent
Expenditures			
Rural Delivery Service	$420,499	$49,805,851	11,744 per cent
Wages, Railway Postal Clerks	8,839,767	28,408,243	221 per cent
Service in Post Offices	51,214,498	139,936,546	173 per cent
Inland Shipments, other than Rail	7,794,212	17,337,637	122 per cent
Shipping Foreign Mails	2,155,567	3,273 436	52 per cent
Railway Mail Pay	37,315,724	59,576,288	60 per cent
Total Expenses	$107,740,267	$298,546,026	177 per cent

Taking all expenses except railway mail pay the increase in 15 years was 239 per cent, while in railway mail pay by itself it was 60 per cent.

Railroad transportation of the mail, says the pamphlet, is the most vital factor in the U. S. Postal Service. "A joint congressional committee in January, 1901, reported that the railroads were not then overpaid; what, therefore, must be the condition now?"

Disastrous Collision at Brandon, Man.

In a collision between a live-stock train and a work train on the Canadian Pacific at Brandon, Manitoba, on the morning of January 12, a foreman and 16 laborers, on the work train, were killed and 10 others were injured. The work train, which was carrying men to clear snow off the track, was moving at very low speed, within yard limits, and the freight train also was moving slowly or had completely stopped; but the collision was sufficiently violent to force a platform car of the work train through the caboose, in which the men were riding. The temperature at the time was 47 degrees below zero, said to be the severest weather in that region for several years, and the injured persons suffered much from frost-bite. The reports say that there was dense fog, making it impossible to see more than a few yards.

A Five-Thousand-Mile Railway Telegraph Line

The Southern Pacific Company, whose chief executive officers are in New York City, has a telegraph line which is operated regularly between New York and Houston, Tex., and between Houston and San Francisco, by its own operators. That part of the line between New York and New Orleans (via Chicago) is leased from the Western Union. West of New Orleans the Southern Pacific has its own wires, and these extend to Portland, Ore., about 5,100 miles from New York. Messages are regularly transmitted from New York to San Francisco, 4,379 miles, with only one rewriting, that at Houston. There are automatic repeaters in the line at Buffalo, Chicago, Memphis and New Orleans; and at San Antonio, El Paso, Tucson and Los Angeles. The wires are worked quadruplex between New Orleans and Houston, between Houston and San Antonio and between Los Angeles and San Francisco. The other parts of the line are worked duplex.

Appealing to the Stockholders

In a recent editorial attention was called to the practice of certain railroads in sending out to their stockholders with the dividend checks little notices to the stockholders regarding various phases of the railroad situation, intended to arouse their interest in the matter. The Lehigh Valley some time ago adopted a similar practice and with the dividend checks mailed out early in October, 1915, there was enclosed an attractive bookmark on which was printed on one side views of scenes along the line of the Lehigh Valley and on the other side a message to stockholders, saying in part: "As a stockholder in this company you are directly interested in its success. You may materially add to its prosperity if you will tell your business friends who control freight shipments to ship via Lehigh Valley. When you travel, or hear of your friends contemplating trips, remind them that the Lehigh Valley offers splendid service. Your co-operation will be sincerely appreciated." With the dividend checks distributed this month a little calendar was enclosed on which was printed on one side: "Boost the Lehigh Valley in 1916." On the other, the following paragraph: "You are one of nearly 9,000 stockholders of the Lehigh Valley Railroad. Everything you can do to influence fair treatment for this and other railroads in the way of reasonable rates, equitable taxation and remedial legislation will be needed. Every passenger and every pound of freight you can get for the Lehigh Valley means a better financial showing for your property."

Proposed Legislation

Representative Cary, of Wisconsin, has introduced in Congress a bill to create the department of transportation, at the head of which would be a member of the cabinet. The bill would make subject to this department not only railroads, but all common carriers and also the marine hospital service, the life saving service, the bureau of navigation, etc. The new department would take over all of the work of the Interstate Commerce Commission except such as relates to rates and classification of freight.

Mr. Lenroot, of Wisconsin, has introduced a bill to authorize the Interstate Commerce Commission to investigate proposed increases or reductions in wages of employees of common carriers, before such changes became effective. If the commission approved an increase of wages, it might then authorize a carrier to increase its rates for transportation. This bill has been referred to the Committee on interstate and foreign commerce. It provides that no reduction in wages made by a carrier affecting an entire class of its employees shall become effective if a railway labor organization to which they belong, or, if unorganized, a majority of the employees affected, shall within 20 days after receiving notice thereof, file in the principal office of the carrier objections thereto, until the proposed reduction shall be submitted to the commission and ratified by it after an investigation. The bill also provides, in the case of a refusal by the carrier of a demand for an increase of wages, that the organization or employees may make application to the commission, whereupon like proceedings shall be had and if the commission shall find that an increase is reasonable it shall determine the amount of the increase and the effective date. "Whenever the Interstate Commerce Commission shall order an increase in wages or refuse to ratify a reduction in wages, it may, if in its opinion by reason of such action it is necessary to insure a reasonable return to the carrier upon the value of its property, at the same time order such increase in the maximum rates that may be charged by such carrier upon interstate freight or passenger transportation, or both, as in its opinion may be just." The bill provides that any such order shall be subject to review in the same manner as the orders of the commission, and stipulates that the provision of this section shall not apply to any controversy submitted to arbitration under the federal laws.

Senator Norris has introduced in Congress a bill to make it unlawful for an interstate railroad to purchase the stock of any other railroad or corporation without first obtaining the consent of the Interstate Commerce Commission.

A bill has been introduced in Congress and has already been passed by the House, to establish in the Department of Labor a bureau of labor safety. It provides that the bureau shall make special inquiries into labor-safety plans and devices of all kinds and also study methods for the prevention of vocational diseases.

Increased Train Service on New York Elevated Railways

The Interborough Rapid Transit Company, New York City, has nearly finished the construction of additional tracks on its elevated lines in Second avenue, Third avenue and Ninth avenue, and this week Monday put on a large number of express trains between the City Hall station and the Borough of the Bronx on the east side of the city, and from Rector street, at the lower end of the Island, to Harlem and beyond on the west side.

By these improvements, the elevated lines on the avenues named are changed, for the greater part of their length, from two-track lines to three-track; and the additional track, which is between the two older tracks, is used for northbound express trains in the afternoon and evening and for southbound expresses in the morning. The improvements are not entirely completed, and for the present the expresses are run only during the rush hours, about four hours in the morning and about four in the evening.

These improvements, including a number of new stations and extensive reconstruction of many of the existing stations, have cost about $15,000,000. For most of the distance the streets are too narrow for the addition both of a track and the necessary enlargement of station platforms, and platforms for the express track have been built above the existing platforms. This makes the grade of the express track undulating; approaching each express station trains on these tracks have to rise about 12 ft. and in leaving the station they make a corresponding descent. At the City Hall terminus, there are now four tracks, two on the former level, used by the Third avenue trains, and two on the new upper level, used by the Second avenue trains. The Second avenue and Third avenue trains cross the Harlem river on a double deck bridge.

The express train service saves passengers about five minutes, in time, as compared with the local elevated service. The distances run by the expresses without stops vary from one mile to about three miles. For example, a northbound express on the Third avenue line runs from Ninth street to Twenty-third street without a stop, and then from Forty-second street to 106th street. The time of an express train from the City Hall terminus to 125th street is about 24 minutes. The chief beneficiaries of the

increased speed, now available, are the residents of the eastern part of the Borough of the Bronx. Heretofore their quickest route to City Hall was by the express trains of the subway; but the subway route lies to the west of Central Park, so that the new express, running over the Second and Third avenue lines, besides equaling the subway trains in speed, have the additional advantage of a shorter route.

On Saturday afternoon, January 15, the extension of the Fourth avenue subway in Brooklyn from 65th street to 86th street, was opened for traffic. This is a two-track underground railroad from the junction of the Fourth avenue and Sea Beach lines down Fourth avenue to 86th street. Two additional tracks in the trunk line of the subway from Manhattan to the Sea Beach junction are also now ready for use, and the New York Consolidated Railroad Company, which operates the line, is to run both express and local trains in the Fourth avenue subway.

A Fifty-Million Dollar Improvement by the New York Central in New York City

Officers of the city of New York and of the New York Central Railroad, after years of negotiation, have reached an agreement on plans for the changes which must be made in the tracks of this road on the west side of New York City (used mostly for freight) to do away with the practice of moving long freight trains through the streets, and to abolish the smoke and noise nuisance in the residence districts. The details of the contract have yet to be formulated, and the officers of the city will have to give further opportunity for tax payers to criticize the arrangements; but the principal antagonistic interests have been brought to agreement, and it is believed that no further serious obstacles will be encountered.

The improvement consists, in brief, of putting all the tracks underground or on elevated structures where the railroad line interferes with street traffic; the provision of electric traction from Spuyten Duyvil, the junction with the main line, through to the southern terminus; and the acquisition of a private right of way by the railroad company from its station at Thirtieth street southward to the freight station at the souhern end of the line. It is estimated that a period of six years will be required for the completion of the work and that the cost to the railroad company will be upwards of $50,000,000. The only expense to be borne by the city is in the shape of contributions of lands and rights, which are estimated as worth $5,000,000 to $6,000,000.

The New York Central's line, double track, from Spuyten Duyvil southward, close to the shore of the Hudson river all the way, to its principal freight terminus, between Seventy-second street and Sixtieth street, is about 8 miles; and to Thirtieth street, which, 45 years ago, was the mail passenger terminus of this road, 10 miles.

The plans show that from the crossing of the river at Spuyten Duyvil, the railroad will go through a tunnel to Dyckman street, and will cross that street by a viaduct. Then, for about three miles, to 135th street, the tracks will be in a subway; that is to say, they will remain about on the present level, but will be covered over. For the next three miles the line skirts Riverside Park, and the park, being on high ground, will be built out to cover the railroad. This, in short, is the essence of the plan all of the way from Dyckman street to the Sixtieth street yard; the present line lies, for the most of the way, at the foot of a steep slope and the differences in construction will be mainly differences in the amount of excavation needed, and in the quantity of concrete required to make the artificial "subway." From the Sixtieth street yard, southward, the line will be carried on an elevated structure in Twelfth avenue, a part of which avenue is yet to be constructed; and from Thirtieth street southward, the elevated line will be continued on a private right of way. The plan seems to be to adjust this lower portion of the elevated structure to the needs of manufacturers, the purpose being to provide side track connections to buildings throughout this disrict. The present terminus is at St. John's Park, about 2½ miles from Thirtieth street. Whether or not a private right of way will be acquired for the whole of this distance, is a point which appears to be as yet not fully settled.

In the course of the negotiations between the railroad and the city, the New York Central has mentioned a plan, probably looked upon as a matter of the distant future, to ask for the right to pierce a tunnel from Sixtieth street eastward across the city about 1½ miles, to the Grand Central Terminal, for a passenger line. As is well known, the present four-track approach to the Grand Central Terminal is used pretty nearly to its full capacity, while the construction of additional tracks on this route is deemed out of the question.

The plans for the extensive improvements outlined above have been prepared under the direction of Ernest P. Goodrich, consulting engineer to the president of Manhattan Borough, New York City; Charles W. Staniford, chief engineer of the Department of Docks and Ferries; John F. Sullivan, engineer of the Bureau of Contract Supervision of the Board of Estimate and Apportionment; George A. Harwood, chief engineer of Electric Zone Improvements, New York Central Railroad; H. D. Jewett, designing engineer, West Side Improvements, New York Central. Approval of both the city and railroad authorities for the proposed improvement and the extension of facilities of the New York Central lines within New York City, from the city line north of Spuyten Duyvil Creek, thence along the westerly side of Manhattan Island and to a southerly terminal in the vicinity of Canal and West streets. The estimated cost of the improvement is approximately $50,000,000. It is expected that the legal approval will be concluded in about two months, after which construction will proceed.

American Museum of Safety

Dr. W. H. Tolman, 18 West Twenty-fourth street, New York, director of the American Museum of Safety, announces that the annual dinner of that organization is to be held at the Waldorf-Astoria hotel, New York City, Thursday evening, February 3. Addresses will be given by W. A. Fairburn, Wilbur C. Fisk and Elmer A. Sperry. The five gold medals annually awarded by the museum will be announced on this occasion.

Railway Fuel Association

At a meeting of the executive committee of the International Railway Fuel Association, J. G. Crawford, vice-president of that association, and fuel engineer of the Chicago, Burlington & Quincy, was appointed secretary-treasurer, vice C. G. Hall, resigned. R. R. Hibben, assistant fuel agent of the Missouri, Kansas & Texas, was appointed vice-president, vice J. G. Crawford and B. P. Phillippe, coal agent of the Pennsylvania Railroad, was appointed a member of the executive committee vice R. R. Hibben. William Schlafge, mechanical superintendent of the Erie, was also appointed a member of the executive committee vice W. C. Hayes, deceased.

June Convention Exhibits

President Ostby and Secretary Conway of the Railway Supply Manufacturers' Association are enthusiastic over the prospects for a record breaking exhibit during the Master Mechanics' and Master Car Builders' Convention at Atlantic City this year. On Saturday, January 8, a circular was sent out to prospective exhibitors outlining the conditions for making exhibits and stating that allotments of space would be made on February 18, 1916. On Tuesday of this week, the 18th, ten days after their circular had been mailed, applications had already been received—and space paid for—for 22,931 sq. ft., or more than 25 per cent of the total space available. These applications came from 59 firms, six of which did not exhibit last year. A number of former exhibitors have applied for larger space this year. At this time last year applications had been made for less than one-half the above amount of space. Indications are that applications will be made for more space than it will be possible to provide.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, date of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—F. A. Pontious, 455 Grand Central Station, Chicago. Next meeting, January, 1916, Atlanta, Ga.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—E. B. Burritt, 8 W. 40th St., New York. Mid-year meeting, February 4, 1916, Congress Hotel, Chicago.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOCIATION.—H. G. McConnaughy, 165 Broadway, New York.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next convention, March 21-23, 1916, Chicago.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 220 W. 57th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, Supt. Timber Preservation, B. & O., Mt. Royal Sta., Baltimore, Md. Next convention, January 18-20, 1916, Chicago.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline,, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Hotel La Salle, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meeting, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Traffic Manager, R. F. & P., Richmond, Va. Annual session, May 17, 1916, Washington, D. C.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month. Room 1856, Transportation Bldg., Chicago.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, C. & E. I., 922 McCormick Bldg., Chicago. Annual meeting, May, 1916, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 1126 W. Broadway, Winona, Minn. Annual meeting, July, 1916.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, C. H. & D., Lima, Ohio. Next meeting, August, 1916, Chicago.

MAINTENANCE OF WAY AND MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—T. I. Goodwin, C. R. I. & P., Eldon, Mo.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Annual convention, May 23-26, 1916, Hotel Hollenden, Cleveland, Ohio.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—C. W. Kelly, 349 People's Gas Bldg., Chicago. Next convention, March 21-23, 1916, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting, 2d Tuesday in month, except June, July, August and September, Boston.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York, Regular meeting, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. N. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.

RAILROAD CLUB OF KANSAS CITY.—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.

RAILROAD MEN'S IMPROVEMENT SOCIETY.—J. B. Curran, Erie R. R., 50 Church St., New York. Meetings, alternate Thursdays, October to May, Assembly Rooms of Merchants' Association, Woolworth Bldg., New York.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 30 Church St., New York. Annual meeting, January 27, 1916, Waldorf-Astoria Hotel, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August. Monongahela House, Pittsburgh.

RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, David Keith Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Piedmont Hotel, Atlanta.

TOLEDO TRANSPORTATION CLUB.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEWARK.—Roy S. Bushy, Firemen's Bldg., Newark, N. J. Regular meetings, 1st Monday in month, except July and August, The Washington, 559 Broad St., Newark.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Waldorf-Astoria Hotel, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Gen'l Agt., Erie R. R., 192 Oliver Bldg., Pittsburgh, Pa., Meetings, bi-monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings, October to May.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, Superintendent's office, N. Y. C. R. R., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit

UTAH SOCIETY OF ENGINEERS.—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.

WESTERN CANADA RAILWAY CLUB.—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor 1112 Karpen Building, Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Grand Pacific Hotel, Chicago.

WESTERN SOCIETY OF ENGINEERS.—E. N. Layfield, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings. Annual meeting, 1st Wednesday after 1st Thursday in January, Chicago.

Traffic News

About fifty railroads in the United States and Canada have issued numerous restrictions covering the acceptance and transportation of explosives, and Col. B. W. Dunn, chief inspector of the bureau of explosives, New York City, has issued a circular summarizing the requirements issued by each road.

The western railways have decided on the same summer tourist fares to Pacific coast points during the summer of 1916, from June 1 to September 30, as were applied during 1915. The fare from Chicago to Pacific coast points via direct routes is $72.50; from St. Louis, $70.00; from Missouri river gateways, $60.00; for tickets routed one way via Portland and in the other direction via California the fare will be $17.50 additional.

The Union Pacific has adopted a new form of physician's certificate for use when passengers traveling on limited tickets are obliged to lie over because of illness. The Interstate Commerce Commission requires carriers in all cases to keep a record of any such extensions of time and to grant them only in case of actual illness sufficiently severe to make travel dangerous to the health of the passenger. No such extension of time may be granted at all, except in accordance with regulations printed in the tariff.

The State Corporation Commission of Arizona proposes to reduce passenger fares in that state to a uniform rate of three cents a mile. The railroads are required to supply data bearing on the subject by February 15 and to appear March 1 at a public hearing to show cause why they should not be required to adopt the reduced rate. The legislature passed a law reducing the fare to three cents, but the act was contested by the railroads and the Supreme Court rendered a decision in the case holding that under the constitution the reduction or fixing of the fare was wholly within the powers and jurisdiction of the corporation commission.

Clifford Thorne, chairman of the Iowa Railroad Commission, has issued a statement explaining the attitude of the Iowa commission in opposing the advances in interstate passenger fares recently allowed by the Interstate Commerce Commission. Mr. Thorne says that passenger rates in the United States, even before the advances, were the highest of any civilized country on earth, and that during the last seven years, under the two cent fares, total passenger revenues of 46 western railroads were $600,000,000 greater than during the seven preceding years of higher fares, and that the railroads would be able to earn a reasonable return on their capitalization without the higher rates.

F. Anderson, officer in charge of the Hudson Bay surveys, does not take a very optimistic view of the navigability of Hudson strait under any conditions. His report of his investigations during the year, contained in the annual report of the Canadian department of naval affairs, would seem to have the effect of a serious damper on any hopes the government may have of the use of the costly Hudson Bay Railway for carrying grain to Europe. Ice conditions make the route impracticable for for something like 10 months every year. The recommendation is made that hydroplanes might be used to warn vessels of iceberg dangers, but it is a question whether this recommendation in the report was not intended to be more or less sarcastic. Mr. Anderson says that navigation would be greatly impeded by ice until the end of August for vessels entering the strait from the east and from early in October for those entering from the west. Fox channel ice began to appear at the west entrance about the latter date last year, greatly interfering with vessels. During the past season, after the middle of September, snowstorms were the order of the day, and this, taken in conjunction with the ice conditions, rendered the period during which ordinary tramp steamers could have navigated the strait with safety very limited.

Newark Traffic Club

The Traffic Club of Newark has adopted the custom of carrying out each year some distinctive feature on the occasion of the club's annual dinner. This year the dinner on January 11, had a "steamship" feature, considered quite appropriate at this time in view of Newark's campaign to make a seaport terminal for itself.

Among the speakers was William G. Besler, president of the Central of New Jersey, who spoke on "The Merchant Marine."

Western Roads Try to Prevent Use of State Fares on Interstate Trips

The western railroads whose interstate passenger fares were advanced on January 15 in accordance with the recent order of the Interstate Commerce Commission, have issued to their ticket agents, baggage men, conductors, collectors, parlor car porters and others, a set of instructions in connection with the new interstate fares for the purpose of defeating the practice of using the lower intrastate fares for parts of an interstate trip. The circular states that under the tariffs lawfully published and filed the interstate fares will in many cases be higher than some of the intrastate fares, and that the interstate fares provided for in the new tariffs are the only fares which can lawfully be applied for interstate trips. All employees are cautioned to be particular to see that the tariff fares, rules and regulations are strictly observed, as neither the company nor its employees may lawfully do anything which would assist passengers in any way in evading payment of the lawful through interstate fare. The instructions include the following:

"Do not sell 'split' tickets (which are defined to mean separate pieces of transportation), when the sale of such tickets will have the effect of furnishing transportation at lower cost than the lawful through fare.

"Do not sell through Pullman or parlor car tickets on 'split' transportation.

"Do not sell sleeping or parlor car tickets beyond destination of rail tickets.

"Passengers who extend their trips beyond the destination of the first sleeping or parlor car tickets must not be given the benefit of through parlor or sleeping car rate from starting point to the farther destination.

"Regular train fare as provided by tariff must be collected from passengers not provided with proper transportation who continue trips beyond the points to which the first transportation is good.

"When passenger's transportation is in two or more parts, treat each part as a separate transaction.

"Do not accept transportation reading to a point at which train is not scheduled to stop, even when tendered in connection with another ticket or cash fare from such nonstop point to destination at which the train does stop

"Train employees must not accept money from passengers for the purpose of purchasing tickets to points beyond the destination of the transportation which they originally present."

These instructions and others are accompanied by explanations. The circular concludes: "Please keep constantly in mind that we must not by any unusual practice assist passengers in evading the payment of the lawful through interstate fare. When it is apparent that passengers are attempting to secure through passage at less than the lawful through interstate fare they should be courteously advised if an opportunity offers that such practices, either by the passenger or by the carrier, are unlawful under the interstate commerce act."

Freight Congestion

Freight congestion at New York Harbor continues with not much change. The number of cars on hand was reported this week as about 2,500 less than a week ago, not sufficient to justify a general lifting of embargoes. The railroads continue to experience difficulty owing to the detention of lighters and barges alongside ocean vessels. The Pennsylvania has removed its embargo from all freight consigned or reconsigned to New York lighterage, Manhattan piers or Greenville piers, except flour, cotton and lumber, for export under through bills of lading, and hay, straw and empty barrels for local delivery. The Delaware, Lackawanna & Western has removed its embargo on export shipments of provisions and perishable freight, when ocean engagements thereon are confirmed.

The Lehigh Valley's embargo now extends practically to all eastbound business.

There is no change in the embargoes previously announced by the Central of New Jersey, the Erie, the Baltimore & Ohio and the New York Central.

The congestion at the Seaboard affects all important grain-carrying roads throughout their whole length. At Chicago the Pennsylvania, the New York Central, and the Chesapeake & Ohio took a little fresh business for export, but were soon obliged to renew their refusal. Cold weather has reduced the efficiency of motive power seriously, making the situation worse.

The Pennsylvania Railroad, in relaxing its restrictions, issued a notice saying:

"It was with much hesitation that the railroad decided practically to remove all embargoes, and it is certain that it will be necessary to impose the restrictions again if shippers fail to coöperate by offering for transportation only such freight as can be disposed of promptly upon its arrival in the New York district. . . . Shippers should understand that this modification was issued in spite of the fact that there has not been any very material reduction in the number of cars we are carrying for export, and that in fact there still remains a considerable accumulation of cars loaded with export freight for New York. . . ."

The congestion on the New York, New Haven & Hartford continues severe. In Connecticut, where the munition factories require thousands of cars beyond the ordinary, the bulk freight yards are full, the freight houses are full, private sidings are full and all other available track space in terminals is full and the officers of the road have told consignees that thousands of cars of freight are held by other roads for delivery into New England.

The Boston & Maine has issued a second embargo notice covering all carload and less than carload freight, except live stock and perishable, consigned, reconsigned or intended for export via Boston.

The Pennsylvania is now receiving grain for export through Baltimore and the Baltimore & Ohio does the same, if the grain is shipped from points on its own system.

THE ENGLISH RAILWAYS AND THE WAR.—The president of the Board of Trade, speaking in Parliament last December, said that the restoration of rolling stock was a matter of great difficulty, because so many railway shops had been taken over for munition work. He assured the house that the government was trying to bring back to railway work a large amount of the equipment, and some of the establishments which should be employed on such work. By this means they hoped to do something to relieve the congestion of the railways. It was necessary, however, to remember that 140,000 railway servants had gone into the army. They had been replaced to some extent by labor from outside, and a considerable number of women had been employed. But the pressure on the railway service was so great that all idea of the limitation of hours had been put to one side.

TRANSANDINE RAILWAY CONSTRUCTION: ARBITRATION AWARD.—The award in the litigation between the Transandine Construction Company and the Buenos Ayres & Pacific and the Transandine Railway Companies has been given by the arbitrator, who sat at the Law Society's offices in London. The plaintiff company claims about $700,000 for alleged breach of contract by the railway companies, the allegation being that the plaintiffs had not been able to proceed with the construction of a railway to connect up the Andes tunnel on the Chilean side because of the failure of the railway companies to bring up the necessary material in time. The arbitrator, in the result, decided in favor of the railway companies on nearly the whole of the claim, and awarded the plaintiffs a small amount of damages in respect of one of the issues. He ordered that the plaintiffs should pay the bulk of the costs of the proceedings.

THE ROUMANIAN RAILWAYS.—The Roumanian railways consume about 40 per cent of the total consumption of liquid fuel in Roumania, and, on the other hand they transport all the petroleum products consumed in the country for various purposes or exported abroad from the ports or through the land frontiers. This question of transport will be changed after the State pipe-line Baicoi-Constantza commences its operations, when a large part of the products exported via Constantza will be transported to this port by the pipe-line instead of along the railways as at present. During the year 1913-14 the number of engines used on the Roumanian railways increased by sixty-one, making a total of 888, of which 751 were using liquid and the remainder solid fuel. In 1913-14 the Roumanian railways consumed 198,085 tons of liquid fuel, showing for the first time for a whole series of years a slight decrease of 6,378 tons, or about three per cent.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

The Public Service Commission of the State of Washington has filed a complaint with the Interstate Commerce Commission charging discrimination against the Northwest in the round trip transcontinental tourist fares by reason of the arbitrary of $17.50, which is added to the rate applying to California for the journey over the Southern Pacific from California to Portland, Tacoma or Seattle.

The Interstate Commerce Commission has announced its intention to continue its inquiry into the ownership and control of the Armour Car Lines and their relations with the railroads, which was interrupted last year by the refusal of F. W. Ellis, vice-president of the car lines, to answer the commission's questions. Chairman McChord is to begin hearings in Chicago on January 24.

Coal from Toluca, Ill.

Opinion by Commissioner Harlan:

It is found that the carriers have not justified a proposed cancellation of joint rates which would result in increased rates on coal from mines on the line of the Chicago & Alton at Toluca, Ill., to interstate points on the Chicago, Milwaukee & St. Paul in Wisconsin, Iowa and Minnesota. (37 I. C. C., 230.)

Grain to the Southwest

Opinion by the Commission.

The commission finds that the carriers have justified a proposed cancellation of joint through rates on grain which will result in higher rates on that commodity from points on the Great Northern in Minnesota and South Dakota to points on the Kansas City Southern in Kansas, Missouri and Oklahoma and points on the Union Pacific in Kansas. (36 I. C. C., 660.)

Rates on Green Salted Hides to Chicago

D. Bergman & Co. v. Chicago & North Western et al. Opinion by the commission:

It is found that the carriers' rates on green salted hides, in carloads, from St. Paul and Minneapolis, Minn., to Chicago and Chicago rate points are unreasonable to the extent that they exceed the rates in effect from the same points to the same destinations on packing-house products, in carloads. (37 I. C. C., 71.)

Colorado Class Rates

Opinion by Commissioner Harlan:

The commission finds that the carriers have failed to justify a proposed withdrawal of the present Colorado common point class rates from St. Paul rate territory and the establishment, in lieu thereof, of through rates based on the combination of intermediate rates over Sioux City, Ia. The carriers are further ordered to maintain rates from the St. Paul territory no higher than the rates from St. Louis. (37 I. C. C. 203.)

Handling of Cattle at El Paso

Cattle Raisers' Stockyards Association v. El Paso & Southwestern et al. Opinion by Commissioner McChord:

The Cattle Raisers' Stockyards Association, made up of cattle dealers in the Southwest, alleged that the Texas & Pacific and the El Paso & Southwestern gave undue preference to the El Paso Union Stock Yards Company of El Paso in the handling of cattle in that city. At the hearing, however, an understanding was reached satisfactory to the complainant. Complaint dismissed. (37 I. C. C., 284.)

Lumber to Wisconsin Points

Opinion by Commissioner Meyer:

The commission finds that the carriers have justified proposed increased carload rates on lumber, all kinds, from certain producing points on the St. Louis & San Francisco, the Missouri Pacific, the St. Louis Iron Mountain & Southern, and the Chicago, Rock Island & Pacific in Missouri and northeastern Arkansas, and also on hardwood lumber from points in southern Arkansas, Texas and Louisiana, to Milwaukee, Wis., and points between Milwaukee and Chicago. (37 I. C. C., 198.)

Lumber from San Pedro to Points in Arizona

Charles R. McCormick & Co. v. Southern Pacific et al. Opinion by Commissioner Clements:

This case results from a complaint alleging that the carload rates on timber and lumber from San Pedro to points in Arizona are discriminatory as compared with rates from Cliffs, Williams and Flagstaff, Ariz., to the same points of destination. The commission states that the existing relation of rates on the commodities mentioned indicates an apparent unlawful discrimination, but that as the present record is inadequate for a determination of the questions involved, the case will be further heard. (37 I. C. C., 234.)

Rates on Ice from Wisconsin Points to Chicago

Eagle Ice Company et al v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Clark:

The commission finds that the carriers have not justified a proposed increased carload rate of 3.5 cents per 100 lb. on ice when moving in ordinary box cars to Chicago from certain points in Wisconsin including Burlington, Camp Lake, Silver Lake, Salem, Fox River, Twin Lakes, Lake Como, etc. The rate was increased from 3 cents in November, 1914, and the complainants desired a rate of 2.5 cents. A rate of 3 cents is prescribed for the future. (37 I. C. C., 250.)

The Detroit Reconsigning Case

Detroit Coal Company v. Michigan Central. Opinion by Commissioner Harlan:

The tariffs of respondents authorized, under certain circumstances, a charge of $2 per car for reconsigning coal at Detroit, Mich., to points within the switching limits of that city, but the commission holds that the provisions of the tariff did not, as contended by the complainant, make the imposition of the charge conditional upon the terminal carriers having first given the consignee at Detroit notice that the car had arrived at Toledo, Ohio. The charges collected upon the shipments involved in this complaint are not shown to have been unreasonable and reparation is denied. (37 I. C. C., 274.)

Through Rates Between Rail and Water Lines

Pine Bluff Traffic Bureau v. Louisville & Nashville et al. Opinion by Commissioner Meyer:

Upon petition that the Louisville & Nashville and other carriers operating between points in the east and Memphis, Tenn., be required to establish through routes and joint rates from eastern points to Pine Bluff, Ark., via Memphis, in connection with the Memphis & Arkansas City Packet Company, which operates a steamboat between Memphis and Rosedale, Miss., and the Pine Bluff & Rosedale Packet Company, which operates a steamboat between Rosedale and Pine Bluff, the commission holds that the interest of the public does not require that through routes and joint rates be established while prevailing conditions continue. (37 I. C. C., 218.)

Coal to Kentucky Points

Opinion by Commissioner Clark:

The commission finds that the Chesapeake & Ohio has not justified a proposed cancellation of joint rates on coal from the Kanawha and Big Sandy coal fields, located on its lines in West Virginia and Kentucky, respectively, to points in central Kentucky on the Louisville & Nashville, the Cincinnati, New Orleans & Texas Pacific and the Frankfort & Cincinnati. If the cancellation became effective, combination rates from 20 cents to 60 cents per ton higher than the present joint rates would apply. The proposed cancellation grew out of a disagreement between the Louisville & Nashville and the Chesapeake & Ohio as to the rates, the Louisville & Nashville having asserted that the rates from the Kanawha coal field were too low in comparison with

the rates from its own Jellico-Middlesboro district. (37 I. C. C., 194.)

Complaint Dismissed

Maley & Wertz et al v. Louisville & Nashville. Opinion by Commissioner Clements:

The commission finds that the defendant's rules and regulations applicable to transit on lumber at points on its system, are not shown to be unreasonable, discriminatory or prejudicial. (36 I. C. C., 657.)

Rates on Salt from Kansas

Morris & Co., et al v. Union Pacific, et al. Opinion by Commissioner Harlan:

A carload rate of 15 cents per 100 lb. on bulk salt from Kansas producing points to Oklahoma City, Okla., is found to be unreasonable to the extent that it exceeds 12 cents. Reparation awarded. (36 I. C. C., 540.)

Lumber Creosoted in Transit at New Orleans

American Creosote Works, Inc., v. Morgan's Louisiana & Texas et al. Opinion by Commission Clark:

The commission finds that a rate of 12.5 cents per 100 lb., charged by the Texas & New Orleans, the Louisiana Western and Morgan's Louisiana & Texas, for the transportation of 25 carloads of lumber from Beaumont and Orange, Tex., creosoted at New Orleans, La., and exported to Central America, was unreasonable to the extent that it exceeded an export rate of 7 cents per 100 lb., plus $5 per car for creosoting in transit. Reparation awarded. (37 I. C. C., 238.)

Increased Commutation Fares Between Baltimore and Washington

George T. Mace et al. v. Pennsylvania et al. Opinion by Commissioner Daniels:

The commission in this case holds that the Philadelphia, Baltimore & Washington was justified in increasing its commutation fares on December 15, 1914, between Washington, D. C., and points on its line between Baltimore & Washington, including the Popes Creek branch. There was an increase of 25 cents in the price of the 50-trip ticket and the price of the 180-trip ticket was made three times that of the new 60-trip ticket instead of being sold as theretofore at a relative discount of 25 per cent; and the 50-trip annual ticket was withdrawn. Statistics furnished by the carriers showed clearly that the train service in this local traffic, taken as a whole, does not appear to have been remunerative, even when viewed by a by-product of the main passenger business. (37 I. C. C., 268.)

Steamship "Great Northern"

Opinion by Commissioner Clark:

The commission holds that the Great Northern and the Northern Pacific may continue to retain their interest in the steamships *Great Northern* and *North Pacific.*

These two boats are owned and operated by the Great Northern Pacific Steamship Company, which is owned by the Spokane, Portland & Seattle, owned in turn by the Great Northern and the Northern Pacific.

The Northern Pacific and the Great Northern and the Spokane, Portland & Seattle, it is held, do or may compete with these steamers in their operations between Flavel, Ore., and San Francisco, Cal., within the meaning of the act. The service of the Great Northern Steamship Company, however, is considered to be in the interest of the public and of advantage to the convenience and commerce of the people. A continuation of same will neither exclude, prevent, nor reduce competition on the route by water, and should be permitted. (37 I. C. C., 260.)

STATE COMMISSIONS

The Missouri Public Service Commission has denied all petitions for a rehearing of the Missouri rate case in which it recently allowed general increases in rates throughout the state, but so small that the railroads declined to accept them. The railroads objected principally to the feature of the decision that compelled them to sell interchangeable and transferable mileage books at two cents a mile, although they were authorized to charge 2½ cents a mile for one-way tickets and 2¼ cents for round trip tickets.

The Missouri Public Service Commission has ordered the Missouri Pacific and the Missouri, Kansas & Texas to install an additional telephone in their stations at Holden, Mo. An act of the legislature of 1911 requires the railroads to maintain free telephone service in their stations. The railroads had installed the service of one telephone company operating in the community, but are now required to install the service of a competing telephone company also.

Attorney General Reed, of Nebraska, and the Nebraska Railway Commission have filed a petition with the Interstate Commerce Commission for a rehearing of the western passenger rate case, in so far as it affects Nebraska. The Kansas Public Utilities Commission has also filed a protest with the commission against the increase in interstate passenger fares as it affects Kansas. The Kansas commission charges that the Interstate Commerce Commission acted arbitrarily and contrary to the evidence and that the facts do not justify the increase allowed.

COURT NEWS

The attorney general of Nebraska has filed in the Nebraska supreme court an application for an injunction against seven railways operating in the state to restrain them from charging any rates for intrastate passenger traffic other than two cents a mile, or from filing any suits against the enforcement of the Nebraska two-cent fare law. The application also asks that the Missouri Pacific be enjoined from refusing to sell 1,000-mile mileage books for $20, as required by the state law, and that it be restrained from discriminating in its rates within the state, on the allegation that the company now charges two cents a mile between points where there is competition, and three cents where none exists.

The attorney general of Minnesota, Chairman Mills of the state railroad and warehouse commission, and G. Roy Hall, traffic commissioner of the Duluth Chamber of Commerce, applied for and obtained a temporary injunction in the St. Louis county district court on January 11, to restrain the Northern Pacific from putting in force on January 15 a new schedule of passenger fares approved by the Interstate Commerce Commission, as applied to routes from Duluth, Minn., to other points in Minnesota where the trains run through Wisconsin for part of the trip. On January 13, notice was served upon the attorney general and the commission directing them to appear in the federal district court at Duluth, on the following day, to show cause why the order issued by the St. Louis county district court should not be dissolved; and after arguments by the attorney general and by Charles Donnelly, assistant general counsel of the Northern Pacific, the court (Judge Morris), issued an order dissolving the restraining order of the district court and sustaining the contention of the road that traffic over its lines from Duluth to Minnesota points routed through Superior, Wis., is interstate traffic. The road did not attempt to advance fares to points which are reached from Duluth without crossing the state line.

Failure to Sand Cattle-Car Floors

Injury to a shipment of mules was caused by the vicious propensities of the animals, incited by the failure of the railroad's servants to sand the floor of the car, leaving it smooth and slippery, causing the mules to fall, and to kick and bite one another. The Kansas City Court of Appeals held the railroad liable for the resulting damage.—Blair Horse & Mule Co. (Mo.) 180 S. W. 412.

Scope of Fireman's Authority

In an action by a locomotive engineer for injury sustained when another engine ran into his and he was caught between his engine and the tender, it appeared that the fireman of the other engine, in violation of the company's rule, attempted to run it himself. The Wisconsin Supreme Court holds that the fireman was not acting without the scope of his authority so as to exempt the employer from liability for his acts. It was his duty to be on the engine to assist in running it, keeping a lookout, ringing the bell, and firing. In doing what he did he

was attempting to further his master s business, by performing his own legitimate duties and those of the engineer as well.—Callahan v. Chicago & N. W. (Wis.) 154 N. W. 449.

Transportation in Payment for Services

In 1910 C. P. Gray made an agreement with the New York Central to make for it a large map of the Vanderbilt lines for the Buffalo World's Fair of 1901. The price agreed on was $750, of which $150 was to be paid in cash and the balance in transportation between New York City and Girard, Pa., over the Central between New York and Buffalo, and another railroad between that point and Girard. The map was made, delivered, and accepted and the cash payment of $150 was made. Between 1900 and 1906 Gray received transportation to the value of $55.77. After the passing of the Hepburn act the railroad refused to furnish any more transportation for his services. Gray brought an action for the unpaid balance of the agreed price of the map. The railroad contended that it was unlawful, under the Hepburn act, to furnish transportation for any part of an interstate journey in payment for services or for any other consideration except a regular fare paid in money. The United States Supreme Court holds that the railroad, in its refusal, acted strictly in accordance with the law; but it did not follow that it could refuse to make just compensation in money for the unpaid balance of the purchase price of the map. It therefore affirmed a judgment for the unpaid balance to be paid in cash.—New York Central v. Gray; decided January 10, 1916.

Limitation of Value Applies to Liability as Warehouseman

The shipper of household goods in interstate commerce, by consenting to a limitation of the value of the shipment to $10 per 100 lb., got a substantial reduction in the freight rate. The goods were not called for by the consignee and they remained in the railroad's possession over the forty-eight hours, after which, according to the bill of lading (which was in the form approved by the Interstate Commerce Commission) they became "subject to a reasonable charge for storage and to carriers' responsibility as warehouseman only." While so held certain of them, of the market value of $2,792, were lost through the railroad's negligence. The Court of Appeals affirmed a judgment for the market value of the goods. While recognizing that the question was a difficult one, it held that the limitation of value did not inure to the advantage of the railroad as warehouseman, that being a distinct service from transportation, for which additional compensation might be charged. The United States Supreme Court has now reversed this judgment, holding that the warehousing is part of the "transportation." Under the provisions of the Hepburn act, the court said: "It is evident that Congress recognized that the duty of carriers to the public included the performance of a variety of services that, according to the theory of the common law, were separable from the carrier's service as carrier, and, in order to prevent overcharges and discriminations from being made under the pretext of performing such additional services, it is enacted that so far as interstate carriers by rail were concerned the entire body of such services should be included together under the single term 'transportation' and subjected to the provisions of the act respecting reasonable rates and the like. The recommendation of the Interstate Commerce Commission for the adoption of the uniform bill of lading was of course made in view of this legislation, and while this recommendation was not intended to be and in law was not binding on the carriers, it is entitled to some weight. It recognizes—whether correctly or not, is a question not now presented—the right of the carrier to make a charge, the amount of which has not been definitely fixed in advance, for storage, as warehouseman, in addition to the charge for transportation; but at the same time it recognizes that a valuation lower than the actual value may be agreed upon between the shipper and the carrier, or determined by the classification or tariffs upon which the rate is based; and it is a necessary corollary that what should be a reasonable charge for storage would be determined in the light of all the circumstances, including the valuation placed upon the goods. We conclude that, under the provisions of the Hepburn act and the terms of the bill of lading, the valuation placed upon the property here in question must be held to apply to defendant's responsibility as warehouseman."—C., C. C. & St. L. v. Dettlebach; decided January 10, 1916.

Railway Officers

Executive, Financial, Legal and Accounting

J. R. Bordeaux has been appointed freight claim agent of the San Pedro, Los Angeles & Salt Lake, with office at Los Angeles, Cal.

R. Marsden Smith, assistant general solicitor of the Baltimore & Ohio, and W. Ainsworth Parker and A. Hunter Boyd, Jr., assistant general attorneys, have been appointed general attorneys. Charles R. Webber, assistant to general counsel, has been appointed assistant general attorney.

Operating

H. B. Green, who has been appointed superintendent of the Baltimore & Ohio, at Cleveland, Ohio, was born on January 28, 1864, at Medina, Ohio, and was educated in the public schools. On June 1, 1880, he entered the service of the Baltimore & Ohio as a clerk at Wheeling, W. Va., and then served consecutively as telegraph operator, agent and yardmaster on the same road until December, 1901, when he was appointed general yardmaster at the same place. He was promoted to division agent on May 1, 1903, and in November of the following year was appointed assistant trainmaster. On April 1, 1906, he was promoted to trainmaster and one year later became superintendent of the Wheeling division at Wheeling, W. Va., which position he held at the time of his recent appointment as superintendent of the Cleveland division of the same road at Cleveland, Ohio, as above noted.

H. B. Green

William H. Averell, who has been appointed general manager of the Baltimore & Ohio in charge of the New York properties of the road, was born on May 13, 1879, at Ogdensburg, N. Y., and graduated from Yale University in the class of 1900. In September of the same year he began railway work in the accounting department of the Great Northern; two years later he entered the service of the Southern Pacific as statistical clerk, and was then consecutively trainmaster at Tucson, Ariz.; assistant superintendent at Bakersfield, Cal.; superintendent at Tucson, Ariz., and superintendent of the same road at Los Angeles, Cal., until February, 1911. The following May he was appointed assistant to general manager of the Baltimore & Ohio; in July, 1912, he was promoted to assistant general superintendent at Pittsburgh, Pa., and on May 1, 1913, was appointed assistant general superintendent of the New York division and general

W. H. Averell

superintendent of the Staten Island lines. He was promoted in March, 1915, to general superintendent of the Wheeling district at Wheeling, W. Va., which position he held at the time of his recent appointment as general manager in charge of the New York properties of the same road, with office at New York as above noted.

Donald French Stevens, whose appointment as superintendent of the Newark division of the Baltimore & Ohio, with office at Newark, Ohio, has been announced, was born at Minneapolis, Minn., on November 4, 1882. He was educated at the Shattuck and Cascadilla preparatory schools and at Cornell University, graduating from the latter institution in 1905. He entered railway service as a rod and instrument man for the Great Northern on June 30, 1897, and remained with that road until June 30, 1899. In 1905 he entered the employ of the Chicago, Rock Island & Pacific as a trackman and track foreman, and from 1906 to 1907 was a track supervisor for the Great Northern. From 1907 to 1914 he was successively yardmaster, trainmaster and terminal trainmaster for the New York, New Haven & Hartford. From May 17, 1914, to November 12, 1914, he was assistant supervisor of fuel consumption for the Baltimore & Ohio. From the latter date to May 17, 1915, he was trainmaster for the same railroad. Up until the time of his recent promotion to the superintendency of the Newark division he was assistant superintendent of the Monongahela division, with office at Grafton, W. Va.

D. F. Stevens

John H. Jackson, who has been appointed superintendent of the Chicago division of the Baltimore & Ohio, at Garrett, Ind., was born at Terra Haute, Ind., and was educated in the common and high schools. He began railway work on October 1, 1893, as a station helper on the Kansas City, Osceola & Southern, at Osceola, Mo. From March, 1894, to February, 1896, he served as a freight truckman and in various clerical positions, including that of cashier, on the same road. He was then agent at the same place until the Kansas City, Osceola & Southern was absorbed by the St. Louis & San Francisco, in 1898, when he became joint agent of the St. Louis & San Francisco and St. Joseph & Grand Island. From 1901 to 1904 he was assistant trainmaster of the St. Louis & San Francisco at Springfield, Mo., then to May of the following year was trainmaster at the same place. He subsequently served as trainmaster at Sapulpa, Okla., Newburg, Mo., Springfield, Mo., and as assistant superintendent at Springfield. In June, 1910, he was appointed superintendent of the same road at Birmingham, Ala. He entered the service of the Baltimore & Ohio, in April, 1914, and was in the office of the general superintendent at Baltimore, Md., until the following May, when he was appointed superintendent of the Newark division at Newark, Ohio, and now becomes superintendent of the Chicago division of the same road as above noted.

J. H. Jackson

George B. Hetherington has been appointed trainmaster of the east Kansas division of the Chicago, Rock Island & Pacific with headquarters at Topeka, Kans.

In our issue of last week it was incorrectly stated that J. Paul Stevens, general superintendent of the Chesapeake & Ohio at Huntington, W. Va., and W. R. Hudson, general superintendent at Covington, Ky., had arranged for personal reasons to exchange positions. The company informs us that no such change is contemplated.

J. F. Keegan, who has been appointed general superintendent of the Wheeling district of the Baltimore & Ohio at Wheeling, W. Va., was born on March 29, 1870, at Cleveland, Ohio, and was educated at St. Columba's Academy, in his native town. He began railway work on November 1, 1885, with the Cleveland, Columbus, Cincinnati & Indianapolis as a telegraph operator, and in June, 1890, left that company to go to the Cleveland, Lorain & Wheeling, now a part of the Baltimore & Ohio, as telegraph operator and car distributor. From September, 1891, to May 15 of the following year, he was train despatcher of the same road at Uhrichsville, Ohio, and was then chief despatcher of the Baltimore & Ohio, at Cleveland. From September, 1903, to September, 1906, he was assistant trainmaster of the same road first at Cleveland and then at Wheeling, W. Va. In September, 1906, he was promoted to trainmaster at Parkersburg, W. Va., and in December, 1910, was transferred in the same capacity to Keyser, W. Va. On March 15, 1911, he was appointed division superintendent of the same road at Wheeling, and in October, 1911, he was made superintendent of the Monongah division at Grafton, W. Va. On May 15, 1913, he was appointed superintendent of the Chicago division, at Garrett, Ind., which position he held at the time of his recent appointment as general superintendent of the Wheeling district of the same road as above noted.

J. F. Keegan

Traffic

L. M. Coffey has been appointed commercial agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Omaha, Neb.

W. F. Brown has been appointed commercial agent of the Central of Georgia, with office at Albany, Ga., vice J. W. Reynolds, resigned to engage in other business.

Charles A. Creitz, traveling freight and passenger agent for The Colorado Midland, at Chicago, Ill., has been appointed general agent at Pittsburgh, Pa., vice A. E. Brown, resigned to accept service in another company.

E. G. Hitt, general western agent of the Atlanta & West Point Railroad and the Western Railway of Alabama, heretofore located at Cincinnati, Ohio, has been transferred to Chicago. The headquarters at Cincinnati have been discontinued.

M. R. Maxwell, general freight agent of the Lake Erie & Western at Indianapolis, Ind., has been appointed general freight agent of the New York Central with authority on the lines west of Buffalo, and headquarters at Cleveland, Ohio.

J. E. Courtney has been appointed general agent, freight and passenger departments, of the Denver & Rio Grande, with office at Chicago, Ill. Mr. Courtney came to Chicago from Denver, Colo., where he was general agent of the freight department.

H. E. Vernon, general agent for the Atchison, Topeka & Santa Fe at Portland, Ore., has been transferred to Honolulu, H. I., where a traffic office will be opened in February. W. A. Hudson has been appointed acting right of way agent, vice R. O. Brewster, with headquarters at Galveston, Tex.

B. S. Atkinson, general freight and passenger agent of the Louisiana & Arkansas, has been appointed traffic manager, and C. F. Schmidt, general agent, has been appointed assistant general freight and passenger agent, with headquarters at Texarkana, Ark. The office of general freight and passenger agent has been abolished.

Russell S. Underwood, assistant to general traffic manager of the Erie at New York, and formerly special representative of the traffic department of the Baltimore & Ohio, has been appointed manager of the Mount Jewett Route, with office at New York. The Mount Jewett Route is a through freight line operated jointly by the Baltimore & Ohio and the Erie for handling traffic between the shipping central west and New England.

H. H. MacCallum, assistant general agent, passenger department, of the Canadian Pacific at Chicago, Ill., has been appointed general agent of the Canadian Pacific Ocean Services, Limited. His territory extends from Detroit, Mich., west to the Pacific Coast and south to the Gulf of Mexico. R. S. Elworthy, chief clerk of the passenger department of the Canadian Pacific at Chicago, has been appointed general agent at Minneapolis, Minn., to succeed Thomas J. Wall, transferred.

George A. Walton, whose appointment as general passenger agent of the Canadian Pacific, western lines, has been announced in these columns, was born at Montreal, Que., on July 17, 1881. He attended the public and high schools of Montreal and graduated from McGill University in the same city. He entered railway service with the Grand Trunk at Montreal on June 12, 1897. On September 1, 1901, he went to Winnipeg, Man., to enter the general passenger department of the Canadian Pacific as chief rate clerk. He was promoted to chief clerk of the same department on June 1, 1903; on April 1, 1906, he was appointed ticket agent for the same railroad at the Winnipeg depot, and on July 15, 1907, was transferred to Brandon, Man., as district passenger agent. He was appointed general agent, passenger department, with headquarters at Spokane, Wash., on April 15, 1910, and remained there until September 1, 1911, when he came to Chicago, as general agent of the same department. On January 1, 1916, he was appointed general passenger agent of the western lines with office at Winnipeg.

G. A. Walton

Richard Moreland Dozier, whose appointment as assistant general freight agent of the Missouri Pacific-St. Louis, Iron Mountain & Southern with office at Omaha, Neb., has been announced, was born at Columbus, Ga., on January 24, 1880. He attended the public schools of his native city, and in October, 1896, entered the service of the Southern at Columbus, Ga., in the division freight office. In February, 1900, he went to New York City where he was employed in the office of the general agent of the Southern, remaining there until June of the same year. From New York he was transferred to the assistant freight traffic manager's office at Louisville, Ky., and in July, 1901, was made private secretary to T. C. Powell, assistant freight traffic manager. In March, 1902, he accompanied Mr. Powell to Washington, D. C., when the latter was promoted to freight traffic manager. In October, 1903, he was made private secretary to J. M. Culp, vice-president of the Southern at Washington. On March 1, 1905, he went to St. Louis, Mo., to become private secretary to C. S. Clarke, vice-president of the Missouri Pacific. On September 1, 1908, he was appointed commercial agent of the Missouri Pacific-St. Louis, Iron Mountain & Southern with office at Memphis, Tenn., where he remained until his recent appointment as assistant general freight agent.

J. D. McNamara, general passenger agent of the Wabash, has been promoted to passenger traffic manager, with office at St. Louis, Mo. He was born at Keokuk, Iowa, in 1871, and entered railway service in 1885, as a ticket checker on the Chicago, Burlington & Quincy. In 1891, he was employed in the accounting department of the same road, and in 1893, was appointed chief division clerk in the passenger department at St. Joseph, Mo. Later in the same year he was transferred to St. Louis, Mo., as chief rate clerk, and in 1896, was appointed chief clerk to the general passenger agent. In 1905, he went to Kansas City, Mo., as southwestern passenger agent, remaining there until January, 1906, when he entered the service of the Wabash as assistant general passenger agent, with office at St. Louis, Mo. In August, 1908, he was promoted to general passenger agent, the position he has continued to hold up to the time of his recent appointment as passenger traffic manager.

J. D. McNamara

As has been announced in these columns, the joint traffic agencies, other than the foreign freight agency, heretofore maintained by the Missouri Pacific-St. Louis, Iron Mountain & Southern in connection with the Denver & Rio Grande and the Western Pacific, were discontinued on December 31. In our issue of January 7 some of the appointments incident to this change were published. The remainder of the traffic appointments on the Missouri Pacific-Iron Mountain follow: Dan Jacobs, assistant general freight agent, Alexandria, La.; C. C. Cloutman, general agent, passenger and freight departments, Atchison, Kan.; E. R. Jennings, district passenger agent, and C. M. Davis, commercial freight agent, at Atlanta, Ga.; Norton England, general southeastern agent, freight and passenger departments, and Garland Tobin, district passenger agent, Birmingham, Ala.; F. L. Feakins, New England agent, passenger and freight departments, and Percy Van Tassell, district passenger agent, Boston, Mass.; R. R. Trimble, general agent, passenger and freight departments, Buffalo, N. Y.; O. P. Applegate, general agent, passenger and freight department, C. A. Torrence, foreign freight agent, G. W. Pither, freight agent, Chattanooga, Tenn.; Ellis Farnsworth, general agent, passenger department, W. C. Staley, general agent, freight department, C. A. Torrence, foreign freight agent; G. W. Pither, commercial freight agent, Chicago, Ill.; J. A. Steltenkamp, general agent, passenger department, and R. Meyer, general agent, freight department, Cincinnati, Ohio; V. K. Norbert, general agent, passenger and freight departments, Cleveland, Ohio; T. A. Helm, general agent, passenger and freight departments, Dallas, Tex.; L. M. White, general agent, passenger and freight departments, Detroit, Mich.; J. J. Eddy, general agent, freight department, and E. G. Popkess, live stock agent, East St. Louis, Ill.; W. N. Cormany, commercial freight agent, Ft. Scott, Kan.; C. E. Carstarphen, general agent, passenger and freight departments, Ft. Smith, Ark.; S. B. Patterson, district passenger and freight agent, Greensboro, N. C.; C. S. Blackman, general agent, passenger and freight departments, Hot Springs, Ark.; C. H. Pugh, district passenger and freight agent, Houston, Tex.; A. L. Trowbridge, general agent, passenger and freight departments, and W. J. Frost, district passenger agent, Indianapolis, Ind.; L. R. Welsh, district passenger agent, and B. L. Swearingen, commercial freight agent, Joplin, Mo.; R. T. G. Matthews, assistant general passenger agent; J. M. Cloyes, general agent passenger department, and L. D. Knowles, general agent freight

department, and W. B. Shirk, general live stock agent, Kansas City, Mo.; E. E. Gibson, general agent, passenger and freight departments, Lake Charles, La.; F. E. Schroeder, assistant general passenger agent; W. W. Richmond, general agent, passenger department, and R. M. McWilliams, assistant general freight agent, Little Rock, Ark.; Paul Escott, general agent, passenger and freight departments, and H. V. Gregory, commercial freight agent, Louisville, Ky.; H. D. Wilson, general agent, passenger department, Memphis, Tenn.; H. N. Atwood, general agent passenger and freight departments, Milwaukee, Wis.; R. B. Wilson, general agent, passenger and freight departments, Minneapolis, Minn.; R. M. Chastain, general agent, passenger and freight departments, Monroe, La.; W. H. Reed, general agent, passenger and freight departments, New Orleans, La.; W. E. Hoyt, general agent, passenger department, and J. B. Trimble, general agent, freight department, New York, N. Y.; T. F. Godfrey, general agent, passenger department, and J. O. Phillippi, commercial freight agent, Omaha, Neb.; C. A. Anderson, general agent, passenger and freight departments, Peoria, Ill.; C. B. Lindsay, district passenger and freight agent, Pine Bluff, Ark.; C. C. McCarthy, general agent, freight department, and W. H. Richmond, district passenger agent, Pittsburgh, Pa.; E. M. Kehoe, general agent, passenger and freight departments, Rock Island, Ill.; N. A. Beach, general agent, passenger and freight departments, St. Joseph, Mo.; J. M. Griffin, general agent, passenger department, and J. L. Amos, general agent, freight department, St. Louis, Mo.; W. D. Young, district passenger and freight agent, San Antonio, Tex.; Clyde Hogsett, district passenger and freight agent, San Jose, Cal.; V. J. Kaiser, general agent, passenger and freight departments, Sedalia, Mo.; R. L. Arnett, general agent, passenger and freight departments, Springfield, Mo.; S. W. Bradford, commercial freight agent, Texarkana, Ark.; C. K. Bothwell, general agent, passenger department, and S. H. Kilgore, commercial freight agent, Wichita, Kan.; J. D. Yates, district passenger and freight agent, Sacramento, Cal.; E. C. Preston, district passenger and freight agent, Fresno, Cal.; G. M. Powers, district passenger and freight agent, Oakland, Cal.

Engineering and Rolling Stock

I. C. Newmarch has been appointed superintendent of shops for the New York Central Lines at Collinwood, Ohio, vice R. H. Montgomery, deceased.

W. E. Dunkerley has been appointed master mechanic of the Yellowstone division of the Northern Pacific with headquarters at Glendive, Mont., vice E. P. Johnson, transferred. Effective January 15.

F. E. More, motive power inspector of the Pennsylvania Lines West of Pittsburgh, western division, has been appointed assistant road foreman of engines, vice F. E. Wilmore, promoted. Effective January 16.

J. A. MacRae has been appointed mechanical engineer of the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn., and J. B. Halliday has been appointed acting master mechanic of the Central and Western divisions, with headquarters at Minneapolis, vice William Gemlo, resigned.

William McNab, principal assistant engineer of the Grand Trunk at Montreal, Que., has been appointed valuation engineer, and Arthur Crumption has been appointed assistant valuation engineer, with headquarters at Montreal. Barton Wheelwright, assistant signal engineer, at Montreal, has been appointed acting signal engineer with headquarters at Montreal.

J. W. Ross, chief despatcher of the Rocky Mountain division of the Chicago, Milwaukee & St. Paul at Three Forks, Mont., has been appointed trainmaster of the Musselshell division, with offices at Miles City, Mont., vice F. C. Dow, transferred, and M. J. Welch has been appointed chief despatcher of the Rocky Mountain division, with office at Three Forks, vice Mr. Ross.

J. M. Meade, engineer of the Atchison, Topeka & Santa Fe, Eastern Lines, has been appointed special engineer, with office at Topeka, Kan. W. G. Massenburg, division engineer at Beaumont, Tex., has been appointed acting engineer of the Gulf lines, with headquarters at Galveston, Tex., vice K. B. Duncan. G. A. Knapp has been appointed acting engineer of the Beaumont division of the Gulf lines, vice Mr. Massenburg. I. H. Drake has been appointed master mechanic of the Pecos division, with headquarters at Clovis, N. M., vice Hugo Schaefer, appointed pilot engineer in the valuation department. J. B. Raymond has been appointed roadmaster on the Beaumont division, with headquarters at Center, Tex., vice Charles Sullivan.

A. M. Williams, supervisor of the Pennsylvania Railroad at Titusville, Pa., has been transferred as supervisor to the office of the division engineer, Buffalo division. R. W. E. Bowler, assistant supervisor at Harrisburg, has been promoted to supervisor at South Fork, Pa. Earl C. Smith, assistant supervisor at Huntington, Pa., has been appointed acting supervisor at Titusville, Pa.

J. H. Hanna, assistant to road foreman of engines of the Pennsylvania Lines west of Pittsburgh, western division, has been appointed road foreman of engines vice C. R. Colmey, deceased. O. E. Maxwell, assistant road foreman of engines on this division has been appointed to assume the duties of J. H. Hanna, promoted, and S. E. Wilmore, assistant road foreman of engines, assumes the duties of Mr. Maxwell, promoted.

H. B. Walkem, resident engineer of the Canadian Pacific at Nelson, B. C., has been appointed assistant engineer and attached to the division engineer's office at Vancouver, B. C. H. G. Barber, assistant engineer, Rogers Pass tunnel construction, has been appointed resident engineer at Nelson, B. C., vice Mr. Walkem. A. C. Ades, roadmaster at Empress, Alta., has been transferred to Medicine Hat, Alta., vice J. H. Baker, promoted. S. T. Brown, roadmaster of the Bassano subdivision, with office at Bassano, Alta., has been appointed roadmaster at Empress, Alta., vice Mr. Ades, and the Bassano subdivision has been placed under the jurisdiction of P. J. M. Woslyng, roadmaster at Bassano. E. Panser, roadmaster at Swift Current, Sask., has been appointed roadmaster of the Assiniboia subdivision, with office at Assiniboia, Sask., vice J. Quinlan, resigned. J. McRea has been appointed acting roadmaster, district 3, Manitoba division, with jurisdiction over Rapid City, Miniota and Lenore subdivisions and Brandon Yard, vice D. McIntyre, transferred, with office at Brandon, Man.

Robert Stevens Parsons, whose appointment as chief engineer of the Erie, with office at New York, has been announced in these columns, was born at Hohokus, N. J., and was educated at Rutgers College. He began railway work in 1895, as a rodman on the Erie; the following year he was made assistant engineer, and in 1899 became division engineer of the New York, Susquehanna & Western. In 1903 he was appointed engineer of maintenance of way of the Erie, and three years later became assistant general superintendent of the same road. He was promoted to superintendent of the Susquehanna division in 1907, and three years later he was transferred in the same capacity to the New York division. On January 1, 1913, he was appointed assistant general manager of the lines east of Buffalo, N. Y., and Salamanca, with headquarters at New York. One year later he was appointed general manager of the Ohio grand division, now known as the Erie Lines West, with office at Cleveland, Ohio, and now becomes chief engineer, with headquarters at New York of the same road.

R. S. Parsons

Charles L. Wallace, whose appointment as valuation engineer of the Texas & Pacific, with office at Dallas, Texas, has been announced, is a native of Indiana. He completed a course at Purdue University in 1903, and in the same year he entered the service of the Cleveland, Cincinnati, Chicago & St. Louis as a rodman. From this railroad he went to the Southern Pacific as a draftsman and transitman. Subsequently he entered the employ of J. S. Coleman, consulting engineer at New Orleans, La., as assistant engineer on municipal and reclamation work. He was then employed by the New Orleans, Great Northern as as-

sistant engineer on location and construction and on the reconstruction of the East Louisiana. As bridge foreman, steam shovel superintendent, and superintendent of construction for W. J. Oliver, constractor, he built bridges on the New Orleans Great Northern and supervised grading, bridging, double track and grade reduction work for the Queen & Crescent in the Cumberland Mountains. In December, 1906, he entered the service of the St. Louis & San Francisco with office at St. Louis, Mo., as assistant engineer on special work, including grade reduction, construction of freight and passenger terminals, etc. He was appointed office engineer for the Kansas City Southern in March, 1911, and in November, 1913, was promoted to assistant chief engineer of the same road. In August, 1914, he was given the additional duties of valuation engineer. He was recently appointed valuation engineer of the Texas & Pacific, but still retains his position as valuation engineer of the Kansas City Southern.

Purchasing

G. E. Motz has been appointed purchasing agent of the Ft. Dodge, Des Moines & Southern with headquarters at Boone, Ia., vice H. S. Moore resigned.

Special Officers

Dr. H. H. Smiley, formerly assistant chief surgeon of the St. Louis Southwestern, has been appointed acting chief surgeon, vice Dr. C. A. Smith, deceased.

OBITUARY

Edward F. Brooks, who was general superintendent of the Philadelphia, Baltimore & Washington until April, 1915, when he retired on account of ill health, died on January 15, at his home in Lansdowne, Pa., at the age of 68.

Frank N. Barksdale, advertising agent of the Pennsylvania Railroad at Philadelphia, Pa., died in that city on January 14, at the age of 61. He entered the advertising department of the Pennsylvania Railroad in 1883, and in 1890 became head of the same department.

A. C. LaMonte, general manager coal mining department of the Delaware, Lackawanna & Western, died on January 16, at his home in Scranton, Pa., at the age of 46. Mr. LaMonte began railway work in July, 1888, with the Central of New Jersey. One year later he became engineer in the coal mining department of the Delaware, Lackawanna & Western, and subsequently served as district engineer, assistant chief engineer, chief engineer and for about one month as general manager of the same department.

George A. Bergen, coal traffic manager of the Erie and the New York, Susquehanna & Western at New York, died in that city on January 13. Mr. Bergen was born in February, 1868, at New York. He began railway work in 1888 as junior clerk in the freight traffic manager's office of the New York, Lake Erie & Western, and had been in the continuous service of that road and its successor, the Erie, ever since. He served consecutively as clerk and stenographer and then as chief clerk in the coal freight department, and later as chief clerk to the third vice-president and general traffic manager. In May, 1904, he was appointed assistant general freight agent in charge of coal and coke traffic, and subsequently was made coal traffic manager of the same road.

THE NORTHERN RAILWAY OF FRANCE IN WAR TIME.—Owing to a very important part of its territory being in enemy's hands, the Nord has suffered more through the war than any other French railway. At the beginning of September, 1914, only 414 miles, or 18 per cent of the total network of 2324 miles, was actually being operated by the company, which indicates the invaluable military services which the Nord rendered during the earliest stages of the war. Today the company is operating a total length of about 1,200 miles, or 51.5 per cent of the entire system. Of the 768 stations on the system, 346 are at present either occupied by the enemy or closed to traffic. Not all the remaining 412 stations are open to the public, a certain number being exclusively reserved for military purposes. The actual situation is that for over a year the Nord has been deprived of the use of most of its great arteries, and the only double-track main line now available is that from Paris to Creil, Amiens, Boulogne, Calais and Hazebrouck.

Equipment and Supplies

LOCOMOTIVES

THE ILLINOIS CENTRAL has issued inquiries for 20 Pacific type locomotives.

THE LIGONIER VALLEY RAILROAD is inquiring for a number of locomotives.

THE CHICAGO & CALUMET RIVER is inquiring for prices on one or two locomotives.

THE BOSTON & MAINE is contemplating the purchase of a large number of locomotives.

THE TOLEDO-DETROIT has ordered one ten-wheel locomotive from the Baldwin Locomotive Works.

THE MISSISSIPPI EASTERN has ordered one ten-wheel locomotive from the Baldwin Locomotive Works.

THE CHICAGO GRAVEL COMPANY has ordered 2 locomotives from the American Locomotive Company.

THE SUGAR LAND RAILWAY has ordered 2 ten-wheel locomotives from the Baldwin Locomotive Works

THE VIRGINIAN RAILWAY has ordered one triple articulated locomotive from the Baldwin Locomotive Works.

THE INLAND STEEL COMPANY, Chicago, has ordered one switching locomotive from the Baldwin Locomotive Works.

JOHN A. ROEBLING'S SONS COMPANY, Trenton, N. J., has ordered one switching locomotive from the Baldwin Locomotive Works.

THE LORAIN STEEL COMPANY, Johnstown, Pa., has ordered one six-wheel switching locomotive from the Baldwin Locomotive Works.

THE BIRDSBORO STONE COMPANY, Philadelphia, Pa., has ordered one six-wheel switching locomotive from the Baldwin Locomotive Works.

THE MANDLE CLAY MINING COMPANY, Whitlock, Tenn., has ordered one four-wheel switching locomotive from the Baldwin Locomotive Works.

THE MINNEAPOLIS, ANOKA & CAYUNA ELECTRIC has ordered one electric locomotive from the McGuire-Cummings Manufacturing Company.

THE AMERICAN SHEET & TIN PLATE COMPANY, Gary, Ind., has ordered one six-wheel switching locomotive from the Baldwin Locomotive Works.

THE ERIE has ordered 10 Santa Fe type locomotives from the Baldwin Locomotive Works and 10 of the same type from the American Locomotive Company.

THE WM. CRAMP & SONS SHIP & ENGINE BUILDING COMPANY, Philadelphia, has ordered one four-wheel switching locomotive from the Baldwin Locomotive Works.

THE INLAND STEEL COMPANY, Chicago, has ordered one six-wheel switching locomotive from the Baldwin Locomotive Works and 2 smaller locomotives from the Vulcan Iron Works.

THE UNION PACIFIC, reported in last week's issue as having issued inquiries for 10 six-wheel switching locomotives, has ordered these locomotives from the Baldwin Locomotive Works.

THE LEHIGH VALLEY, reported in the *Railway Age Gazette* of December 24 as being in the market for 15 switching locomotives, has ordered these locomotives from the Baldwin Locomotive Works.

THE NEWBURGH & SOUTH SHORE has ordered 2 Mogul locomotives from the Baldwin Locomotive Works. These locomotives will have a weight on the driving wheels of 168,000 lb. and will be equipped with superheaters and brick arches.

THE DETROIT, TOLEDO & IRONTON, reported in the *Railway Age Gazette* of December 3 as being in the market for a number of freight locomotives, has ordered 2 consolidation locomotives from the American Locomotive Company. These engines will

have 25 by 30-in. cylinders, 52-in. driving wheels and a total weight in working order of 250,000 lb.

ROBERT W. HUNT & Co., Pittsburgh, Pa., invites tenders for 2 six-wheel switching, 4 consolidation freight and 4 ten-wheel passenger locomotives for the Hupei-Hunan section of the Canton-Hankow Railway of China. Conditions of contract, drawing, etc., can be obtained on payment of $2.50 at the offices of the company, Monongahela building, Pittsburgh. The tenders will be opened at 10 A. M., January 31, 1916.

FREIGHT CARS

THE DIAMOND ALKALI COMPANY is reported in the market for 10 ore cars.

SWIFT & Co. is reported to be building 100 refrigerator cars in its own shops.

THE NASHVILLE, CHATTANOOGA & ST. LOUIS is reported in the market for 20 dump cars.

THE CINCINNATI, NEW ORLEANS & TEXAS PACIFIC is inquiring for prices on 1,000 box cars.

THE ILLINOIS CENTRAL has issued inquiries for 300 steel underframe stock and 1,000 coal cars.

THE LAKE COUNTY GRAVEL COMPANY has ordered one gravel car from the Standard Steel Car Company.

THE CANADIAN GOVERNMENT RAILWAYS have ordered 200 30-ton wooden box cars from the Canadian Car & Foundry Company.

THE CHICAGO, BURLINGTON & QUINCY has ordered 50 automatic air dump cars from the Western Wheeled Scraper Company.

THE PENNSYLVANIA RAILROAD has ordered 3,000 (H-21) hopper gondola cars from the Cambria Steel Company and 2,000 of the same type from the Ralston Steel Car Company.

THE PITTSBURGH STEEL COMPANY, Pittsburgh, Pa., reported in the *Railway Age Gazette*, of January 7, as having issued inquiries for 40 50-ton ore cars, has ordered these cars from the Standard Steel Car Company.

THE FRENCH GOVERNMENT was reported in last week's issue as having given the National Steel Car Company, Ltd., Hamilton, Ont., an order for 4,000 freight cars. These cars are light four-wheel cars of 18-ton capacity. They will be about 8 ft. 6 in. wide and 24 ft. long. They will have 41-in. rolled steel wheels, journal bearings, 5½ by 10 in. in size and will be equipped with screw brakes.

PASSENGER CARS

THE INTERNATIONAL & GREAT NORTHERN has issued an inquiry for 5 coaches, 2 dining cars, 2 postal and 2 baggage cars.

THE WABASH, has ordered six postal cars from the American Car & Foundry Company.

THE ILLINOIS CENTRAL has issued inquiries for 45 coaches, 10 dining cars, 4 mail cars, 6 mail and baggage cars, 4 buffet cars, 18 baggage cars and 7 chair cars.

THE CINCINNATI, INDIANAPOLIS & WESTERN has ordered 3 coaches, one dining car, 3 passenger and baggage cars and 2 postal cars from the American Car & Foundry Company.

THE NEW YORK MUNICIPAL, reported in the *Railway Age Gazette*, of December 10, as having issued inquiries for 100 subway cars, has ordered 200 of these cars from the American Car & Foundry Company. An order for 100 subway cars was prematurely reported in the issue of December 24. This order for 200 cars will bring to 500 the total number of cars ordered by this company for operation on its Fourth Avenue Line in the Borough of Brooklyn.

IRON AND STEEL

THE CLEVELAND RAILWAY COMPANY is inquiring for prices on 2,500 tons of rails.

THE PITTSBURGH & LAKE ERIE has ordered 6,000 tons of rails from the United States Steel Corporation.

THE CHICAGO, MILWAUKEE & ST. PAUL has ordered 30,000 tons of rails from the United States Steel Corporation.

THE LEHIGH VALLEY has ordered 175 tons of steel from the King Bridge Company, for a bridge at Geneva, N. Y.

THE ERIE has ordered 1,500 tons of steel from the American Bridge Company for a bridge over the Susquehanna river.

THE SOUTHERN RAILWAY has ordered 300 tons of steel from the Virginia Bridge & Iron Company for a repair shop at Knoxville, Tenn.

THE UNITED STATES STEEL PRODUCTS COMPANY has received an order for 4,000 tons of rails for India and 2,000 tons for Portuguese, East Africa.

THE CHICAGO, MILWAUKEE & ST. PAUL has ordered 113 tons of steel from the Chicago Bridge & Iron Company for the Reed street subway, at Milwaukee.

THE TOLEDO, ST. LOUIS & WESTERN has ordered 1,300 tons of steel from the American Bridge Company for a new bridge across the Wabash river at Silverwood, Ind.

THE SPOKANE, PORTLAND & SEATTLE has divided an order for 101 tons of steel for bridges at Seattle, between the McClintic Marshall Company and the Pennsylvania Bridge Company.

MACHINERY AND TOOLS

COMPAGNIE COMMERCIALE EL INDUSTRIELLE, BJÖRKGREN & Co., Stockholm, Sweden, is asking prices in this country for the following machines: 2 wheel-turning lathes, diameter of the wheels 1,800 mm., distance between centres 2,440 mm.; 4 hand machines for turning locomotive crank pins; 2 portable machines for checking over the dimensions of locomotive cylinders, diameter, 500 mm., with electric and hand drive; 4 car axle-journal turning lathes with hand drive; 2 similar lathes, diameter, 730 mm.; 3 precision automatic turret lathes for 6 tools, with taper attachment for the wholesale production of armature fittings, height of centres 200 to 250 mm., distance between centres 800 to 1,200 mm., spindle bore minimum 50 mm., minimum weight 1,500 kg.; 2 vertical drilling machines for drills up to 2½ inches, greatest distance between spindle and table 32 inches, greatest distance between spindle and base plate not under 5 ft. 6 in., table not under 20 inches in diameter, the machines to be supplied with chuck, overhead countershaft and tools; 2 drilling machines for 3½-inch drills.

SIGNALING

THE PENNSYLVANIA RAILROAD has ordered from the Western Electric Company telephone equipment for train despatching lines on five sections of the road, aggregating 577 miles of line.

THE FRENCH PRESIDENT'S TRAVELING ALLOWANCE.—The French president's salary is increased to about $210,000 a year by a special annual traveling allowance of $60,000. When Marshal MacMahon was president, Toulouse and other cities were devastated by a great flood, and Gambetta, who was then chairman of the committee of ways and means, made the president a special allowance to enable him to visit the affected districts at the expense of the state. Originally, the grant was only intended to be made for that particular year, but it was ultimately decided to continue it permanently, the reason being that it was considered desirable that the president should keep in constant touch with the country by means of personal visits to different localities. The president spends practically every penny of the $60,000, although the railways insist on conveying him for nothing. The reason is that gifts to railwaymen and local officials, and donations to hospitals, charitable institutions, and the host of local associations and societies which come into the limelight on the occasion of a presidential visit, swallow up nearly the whole of the sum. It should be added that this travelling allowance is quite distinct from the grants made to presidents for entertaining Royalties or for according hospitality during International Exhibitions.—*Railway Gazette, London.*

Supply Trade News

Maynard D. Church has been appointed chief engineer of the Terry Steam Turbine Company, Hartford, Conn.

The New York office of the Locomotive Stoker Company has been removed from Room 1032, 30 Church street, to Room 1381, 50 Church street.

Edwin Rickey, manager of railway sales of the Moeschl-Edwards Corrugating Company, Covington, Ky., has been appointed general sales manager, with office in the same city.

Austin D. Mixsell, vice-president of the Bethlehem Steel Company and president of the Detrick & Harvey Machine Company, Baltimore, Md., a subsidiary company, died on January 15

M. P. Tierney has been appointed representative for Modjeski & Angier, inspecting civil engineers, with offices at E-17 Railway Exchange building, St. Louis, Mo., to succeed W. F. Randolph, effective January 15, 1916.

Willard Doud, consulting engineer on matters pertaining to design, construction, equipment and operation of railroad and industrial shops and power plants, has moved his offices to 445 Old Colony building, Chicago.

Edwin H. Bell, vice-president of the Railroad Supply Company, with office at Chicago, on January 18, was elected president of the company, succeeding Henry S. Hawley, deceased. H. M. Buck, eastern sales agent at New York, was elected vice-president, succeeding Mr. Bell, J. A. Colby, auditor, was elected treasurer, and P. W. Kohnen was elected secretary of the company. Mr. Bell was born in Philadelphia, Pa., and has been a resident of Chicago since 1896. After attending the public schools and graduating from the Blairstown Academy, Blairstown, N. J., he took a course of business training in the Pearce Business College at Philadelphia. In 1890 he was employed in the general manager's office of the Lehigh Valley Railroad at Buffalo, and in 1897 he entered the employ of the Railroad Supply Company. In 1906 he was elected vice-president in which capacity he has served until his election as president.

E. H. Bell

The J. C. Russell Shovel Company, Pittsburgh, Pa., announces that it has made an arrangement effective at once with R. L. Mason, 1501 Oliver building, Pittsburgh, to act as its special representative in the railroad field. Mr. Mason will have charge of the company's railroad sales of track shovels and locomotive scoops in Pittsburgh territory.

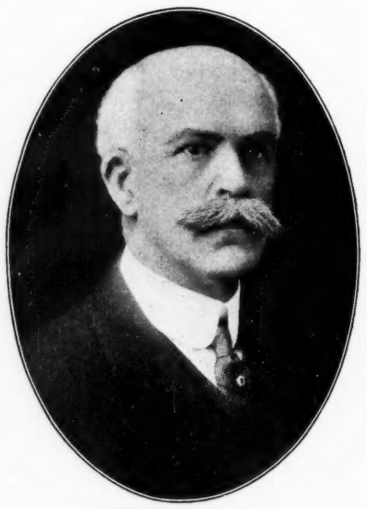
Lloyd H. Atkinson and John J. Utech announce that they have incorporated a company bearing the name of Atkinson & Utech, Inc., with offices at 111 Broadway, New York, to do a general railway supply business. Mr. Atkinson, who will hold the position of president, was for eight years rail sales agent of the Bethlehem Steel Company. Mr. Utech was for many years connected with the Carnegie Steel Company, the American Foundries Company and more recently with the Alliance Machine Company as manager of the company's eastern office.

W. E. Ballantine, manager of railway sales of the Willard Storage Battery Company, Cleveland, Ohio, whose death in Cleveland, Ohio, on Tuesday, January 11, was announced in this column last week, had a very wide acquaintance among railway car lighting men. Mr. Ballantine was in his forty-first year. He was appointed assistant electrical engineer of the Pullman Company in 1900, in 1903 becoming electrical engineer of that company in charge of the electric light plant, shop wiring, manufacture of storage batteries, electric manufacturing equipment, and the equipping of cars with electricity. In 1905 he was appointed chief electrician of the Rock Island Lines in charge of all car lighting and electric head lighting equipment. Four years later he became western manager of railway sales of the Willard Storage Battery Company, and in 1913, succeeded to the position of manager of railway sales with headquarters at Cleveland, Ohio.

The Economy Devices Corporation, New York, was announced in the *Railway Age Gazette* of December 31 as having opened a western office at room 1634, McCormick building, under the management of Joseph Sinkler. Mr. Sinkler has been in the service of the Franklin Railway Supply Company for nearly twelve years. He was born at Scranton, Pa., December 14, 1874. He began his mechanical career with the Dickson Locomotive Works, Scranton, Pa., with which company he remained three years. He later was in the employ of the New York, Susquehanna & Western for two years and for a succeeding two years in that of the Delaware, Lackawanna & Western. He became associated with the Franklin Railway Supply Co. on July 1, 1904.

J. Sinkler

W. Frank Carr, whose appointment as Pacific Northwest Coast representative of the Chicago Railway Signal & Supply Company, with headquarters in Seattle, Wash., was mentioned in the *Railway Age Gazette* of January 14, was born in Holyoke, Mass., January 1, 1861. He received a technical education in the Massachusetts Agricultural College and the Massachusetts Institute of Technology; served as assistant bridge engineer of the Boston & Lowell, now a part of the Boston & Maine, from 1884 to 1885; was for one year a professor in the engineering department of the University of Minnesota, and in August, 1888, became assistant engineer of the Minneapolis & St. Paul Street Railway. In 1890 he was appointed chief engineer, resigning in December, 1891, to become general manager and chief engineer of the Roanoke (Va.) Street Railway and the Roanoke Electric Light Company. Between March 1, 1895, and June 1, 1896, he was superintendent of electric construction of the West Chicago Street Railway (Yerkes' System), covering the period of the change in motive power from horse to electricity. He also superintended the electrification of the Lake Street Elevated Railroad (Chicago & Oak Park Railroad). In June, 1896, he was appointed chief engineer of the Yerkes Company, filling that position until April, 1899. At the time of the organization of the Falk Company, Milwau-



W. Frank Carr

kee, Wis., steel founders and manufacturers, in 1899, Mr. Carr was appointed chief engineer, which position he held for twelve years. During the past four years he has been located on the Pacific Coast, for two years as manager of the railway department of Parrott & Company, with headquarters in San Francisco, later as Pacific Northwest manager of the Western Engineering Sales Company, with headquarters in Seattle. He has also been practicing as consulting civil engineer, specializing in valuation, quantity surveys in railways and public utilities.

Charles C. Schneider, for about ten years consulting engineer of the American Bridge Company, died at his home in Philadelphia, on January 8, at the age of 72. Mr. Schneider was born at Apolda, Saxony, Germany, in 1843. He graduated from the Royal School of Technology at Chemnitz in 1864, and three years later came to America to serve as a draftsman and designer in the Rogers Locomotive Works at Paterson, N. J. In 1870 he left that company and for three years was with the Michigan Bridge & Construction Company, Detroit, Mich. In 1873 and until 1876 he was in the office of the chief engineer of the Erie Railroad. In 1876 he was engaged to pass upon plans for a bridge across the East river at New York between the Borough of Manhattan and Long Island City, and upon the completion of the work on this bridge, which, incidentally, was never built, he entered the employ of the Delaware Bridge Company. In the latter part of 1877 he opened an office as consulting engineer in New York City, and was actively engaged from 1879 to 1883 in bridge design. In 1886 he became chief engineer of the Pencoyd Iron Works, and in 1893 designed a bridge across the East river for the Long Island, which bridge, like the earlier one, was never completed. Later when the American Bridge Company acquired the Pencoyd Iron Works, he entered the service of the latter company, serving it for four years as chief engineer and vice-president, and for the following ten years as consulting engineer. Mr. Schnieder was president of the American Society of Civil Engineers in 1905 and twice won the association's Norman medal, and in 1886 the Thomas Fitch Rowland prize, the last being awarded to him for his paper on the "Cantilever Bridge at Niagara Falls."

TRADE PUBLICATIONS

TESTING MACHINES.—Catalog No. 93, recently issued by the Watson-Stillman Company, Aldene, N. J., describes in detail the Sturcke-Watson-Stillman testing machine for cylindrical gas containers. The booklet describes and illustrates the machine and explains its uses and possibilites.

POWER HAMMERS.—A booklet recently issued by Beaudry & Co., Inc., Boston, Mass., describes and illustrates the company's line of Champion and Peerless power hammers. The various types of hammers are described in some detail and information is given concerning the kind of work for which each hammer is best fitted.

FILING CABINETS.—The Yawman & Erbe Manufacturing Company, Rochester, N. Y., has recently issued a booklet entitled "The Proper Place for Blue-prints and Drawings," emphasizing the necessity for adequate filing systems for the drafting room and detailing the advantages of the Mammoth Vertical File, made by the company, for blue-prints and other drawings.

HEAVY SERVICE FLOORS.—The Southern Pine Association, New Orleans, La., has issued an attractive 32-page booklet describing the merits of wood blocks for interior and exterior floors. It is well illustrated with photographs of a wide variety of illustrations, including the Central of Georgia shops at Macon, Ga., the Erie pier at New York City, and platform and team track pavements.

ELECTRICAL SUPPLIES.—The Western Electric Company's 1916 Year Book, which is now being distributed to the trade, contains 1,504 pages, nearly 300 pages more than the first edition of the Electrical Supply Year Book which the company published on January 1, 1915. The book contains illustrations and list prices of the extensive lines of electrical equipment which are sold by the company, and like the 1915 year book, it is characterized by list prices which are subjected with very few exceptions to a single discount for all the lines included. The Western Electric Company announced last year that it was its intention in the future to revise its catalogue yearly, and the present edition is a result of that policy.

Railway Construction

CANADIAN NORTHERN.—This company will apply to the Canadian Parliament for an extension of time in which to build from a point on the Oak Point branch at or near Grosse Isle, Man., northerly and westerly to Grand Rapids, with a branch to a point on Sturgeon Bay.

CUMBERLAND & MANCHESTER.—A contract has been let to the Read Construction Company, of Hazleton, Pa., and work is now under way building this line. The plans call for a line from Barbourville, Ky., in Knox county, north up Little Richland creek to the summit, six miles, thence along Collins Fork and Goose creek to Manchester, 24 miles. About half the line will be tangent. There are two ten-degree curves, and the ruling grade is 1.25 per cent for two miles. The work involves about 250,000 cu. yd. of excavation, and there will be five steel bridges on the line. The company expects to develop a traffic in coal, lumber, merchandise and salt. F. M. Heidrick, president; M. Posey, chief engineer. C. F. Heidrick, Barbourville, Ky., may be addressed. (June 4, p. 1181.)

ELBERTON & EASTERN.—A contract has been given to the Nichols Construction Company, Atlanta, Ga., to build an extension from Tignall, Ga., southeast to Lincolnton, 17 miles, also to build an extension from Tignall south to Washington, 12 miles. There will be about 12,000 cu. yds. of excavation work to the mile. The maximum grade will be one per cent and the maximum curvature four degrees. There will be one timber trestle calling for 52,000 ft. b. m., and six station buildings on the extensions. The company now operates a line from Elberton south to Tignall, 21.8 miles. Construction work on the extensions is to be started at once.

MINNESOTA TRANSFER.—This company, which operates a terminal switching road for all railroads entering St. Paul, Minn., and Minneapolis, laid 2.46 miles of industrial tracks during 1915.

NEW YORK SUBWAYS.—The New York Public Service Commission, First district, has awarded the contract for the construction of Section No. 3 of Route No. 8, the tunnel portion of the Fourteenth Street-Eastern Rapid Transit Railroad, to Booth & Flinn, Ltd., the lowest bidders, for $6,639,023. The section runs from a point under Fourteenth street, in the borough of Manhattan, about 80 ft. west of Avenue B, to and under the East river to a point under North Seventh street, in the borough of Brooklyn, about 50 ft. west of the center line of Bedford avenue. The plans call for the construction of a two-track railroad and the tunnel must be ready in 27 months.

The commission has approved the award by the New York Municipal Railway Corporation of the contract for the construction of the East New York additional tracks and reconstruction of the East New York yard to the Grenshaw Engineering & Construction Company, Inc., the lowest bidder, for $1,237,229. The work includes the alterations and additions to the existing elevated structures, the installation of tracks and special work, the removal and relocation of wires and cables, the construction of three new elevated stations, and the maintenance of existing station facilities during construction. The company provides all the materials for the work, which must be completed within two years from the date of the contract.

NORFOLK, WASHINGTON & NEW YORK.—See Washington-Newport News Short Line.

PALESTINE, CORSICANA & DALLAS.—The project to build a railway from Palestine, Tex., northwest to Corsicana, thence to Dallas, about 120 miles, has been revived by W. H. Mitchell and associates of Palestine. Construction of such a line has been under consideration at various times for several years, and it was reported that considerable grading had been done on the section between Palestine and Corsicana. It is said that the present promoters have secured the necessary financial aid to carry out the work and that the line will be built during 1916.

POTOMAC RIVER & BALTIMORE.—See Washington-Newport News Short Line.

TOLEDO-DETROIT.—This company, newly formed, will comprise the old Toledo, Ann Arbor & Jackson and an extension to be

built from Petersburg, Mich., to Dundee, where it will connect with the Detroit, Toledo & Ironton. From Dundee, it will operate over the latter line to Detroit. C. H. Burkhalter, secretary, terminal building, Toledo, Ohio.

WASHINGTON-NEWPORT NEWS SHORT LINE.—The State Corporation Commission of Virginia has granted a charter to this company with $25,000 capital to operate a railroad from Newport News, Va., to Washington, D. C. It is announced that the company is to be a consolidation of the Norfolk, Washington & New York and the Potomac River & Baltimore, which have been chartered and are to form part of the same system, one to operate in Virginia and the other in Maryland. Construction work will be started at once. A connection with the Baltimore & Ohio will be made at the District of Columbia boundary. F. S. Gannon, president, Staten Island, N. Y.; F. S. Gannon, Jr., vice-president; W. H. Siebert, treasurer, Garden City, L. I.; W. J. Burlee and Channing M. Ward, Richmond, Va., are directors.

WESTERN & ATLANTIC.—The Western & Atlantic Railroad Commission (C. M. Candler, chairman)—the committee recently constituted by the legislature of Georgia to consider what shall be done with this state-owned railroad after the present lease to the Nashville, Chattanooga & St. Louis shall have expired, has advertised for proposals to extend. The advertisement is in substance as follows: Pursuant to the provisions of section 16 of the act of the general assembly of Georgia, approved November 30, 1915, entitled "an act to provide for the leasing or other disposition of the Western & Atlantic Railroad and its properties," etc., the Western & Atlantic Railroad Commission is prepared to receive and invites, in writing under seal, addressed to the commission at Atlanta, Ga., information from any reliable source as to any survey or surveys which have been made from any point on the coast of Georgia toward Atlanta, for the construction of a standard gage railroad, together with maps showing the mileage surveyed as well as constructed, the counties traversed, or to be traversed, estimates as to cost and character of construction, equipment, etc., as set out in paragraph 3 of said section 16 of said act. The said commission is also prepared to receive under seal in writing, from any person, association or corporation who may desire to submit such propositions to construct or submit plans for the construction and equipment of an extension of the Western & Atlantic Railroad to the sea, as set out in paragraph 6 of said section 16 of said act. Printed copies of the lease act will be mailed to all applicants.

WESTERN MARYLAND.—A contract is reported let to Claiborne, Johnston & Co., Baltimore, Md., for grading four miles for second track between Edgemont, Md., and Blue Mountain.

WESTERN TERMINAL RAILWAY.—Application has been made by this company to the Duluth, Minn., city council for a franchise to build a terminal railway. The plans call for a four-track system through the center of the city, connecting with all the railroads in Duluth. The company also plans to put up a passenger station and freight house.

RAILWAY STRUCTURES

BALTIMORE, MD.—The Pennsylvania Railroad has begun work on a new coal pier at Canton Wharves, Baltimore, which will be equipped with facilities capable of handling 20,000 tons of coal per day into vessels. Contracts have been let to the Maryland Dredging & Contracting Company, Baltimore, Md., for dredging at the dock and grading the yard for 1,000 cars which will be part of the entire layout; to the Arthur McMullen Company, New York, for the building of the pier and to the Mead-Morrison Manufacturing Company for the machinery. The pier will be 940 ft. long and 66 ft. wide. It will be built on creosoted piles with a reinforced concrete floor and concrete bulkhead. Space will be provided for loading four vessels at a time. Connected with the pier there will be a thawing house for 30 cars and storage bins for coal for local harbor trade. (October 8, 1915, p. 670.)

NEWBERN, N. C.—The Norfolk Southern opened bids on January 15 for rebuilding the shops at New Bern, which were destroyed by fire on November 16. The total cost will aggregate about $14,000. A contract for the work is reported let to J. Johnson, Norfolk, Va.

NEW YORK.—See NEW YORK SUBWAYS, under RAILWAY CONSTRUCTION.

Railway Financial News

CHICAGO, ROCK ISLAND & PACIFIC.—The finance committee at a recent meeting invited H. P. Davison, of J. P. Morgan & Company, to be present. This fact has led to speculation as to whether the Morgan firm might take part in the reorganization of the Chicago, Rock Island & Pacific. *The Wall Street Journal* says that it is believed that the conference dealt largely with the question of providing for the $7,500,000 two-year six per cent notes due next month.

The $500,000 interest due January 15 on the $20,000,000 debenture bonds was not paid. The company has 60 days' grace in which to pay this interest before it can be judged in default. The company availed itself of this period of 60 days' grace before paying the semi-annual interest which was due six months ago.

MINNEAPOLIS & ST. LOUIS.—The plan for a banking syndicate to buy the collateral under the $2,500,000 two-year six per cent notes due February 1, has been abandoned and a new plan has been put forth which calls for an assessment of $12 a share on the $5,917,500 preferred and $15,370,200 common. Under this plan stockholders that do not pay the assessment will be called on to turn in 45 per cent of their stock holdings.

VIRGINIAN RAILWAY.—The New York City Bank, New York, has bought $2,500,000 first mortgage 5 per cent bonds of 1912-1962.

WABASH-PITTSBURGH TERMINAL.—It is said that a plan will be put forward by the interests which are opposed to the Ely plan of reorganization. This new plan will provide for a long-term bond issue of $22,000,000 and consolidation of the Wabash-Pittsburgh Terminal and the Wheeling & Lake Erie.

WHEELING & LAKE ERIE.—See Wabash-Pittsburgh Terminal.

THE ENGLISH RAILWAY EQUIPMENT SITUATION.—The president of the Board of Trade was recently asked whether or not it was a fact that 10,000 wagons were at present under repair. In a speech in the House of Parliament on December 22 he said that he could not verify this figure, but he was sure that every car which could be safely run was being run. The Railway Gazette, London, believes that 10,000 or 20,000 or even 30,000 would be nothing unusual. This conclusion is based on the railway's annual reports. On December 31, 1913, the eight heavy English companies—the Great Central, Great Eastern, Great Northern, Great Western, Lancashire & Yorkshire, London & North-Western, Midland and North-Eastern—which owned an aggregate of 524,510 cars, had 14,293 under or awaiting repair. On this basis there would be for the United Kingdom, with a total according to the Railway Returns for 1913, of 760,746 wagons, over 20,000 wagons under repair. That was before the war. Now, probably, it believes, there are quite twice as many requiring repair, but this is but five per cent of the whole.

THE PUERTO BOLIVAR-AMAZON RAILWAY OF ECUADOR.—A recent consular report says that surveys are now nearly completed, 227 miles having now been gone over. This railway will start at Puerto Bolivar on the coast. The first section extends nearly straight to Machala, continuing to Santa Rosa, thence to Torata Pass, and ascends the hill at Garanta de Piñas. From there it descends to cross the Colera, Amarilla, Luis and Embocas rivers, rising to the pass of Santa Ana, whence it descends to a point 85 miles from the coast. On the second section, the line ascends to Toronche Pass, and descends to the Catamayo Valley, crossing the Guayabal and La Toma rivers. From there it against rises to the Cajanuma Ridge, to descend until it reaches the city of Loja, 105 miles. The third section makes a considerable curve between Loja and La Toma, so as to reach a carboniferous region, and then crosses the fertile and extensive valley between the Malacatos and Catamayo rivers. The surveys for 37 miles of this section have been approved. At least eight tunnels will be constructed within five miles, at a point 75 to 80 miles inland. One of the tunnels to be constructed at Toronche Pass, will be 1,283 feet long.